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SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of published articles on limnology, ecology, natural history and other fields of specialization are included when the subject has application to the conservation and management of sport fishery resources.

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17385. Kyazimov, I. B., and D. I. Safarov (Azerbaĭdzhan Div. of TsNIORKh, USSR). 1973. THE REARING OF YOUNG STEELHEAD TROUT IN AZERBAĬDZHAN (Vyrashchivanie molodi stal'nogolovogo lososya v Azerbaĭdzhane). Rybnoe Khozyaĭstvo No. 10, pp. 19-20. In Russian.

Steelhead trout have been raised successfully at two fish factories in Azerbaĭdzhan as part of the effort to increase the salmon fishery in the Caspian basin. Planted in the Kura River were yearlings in the amount of 41.8% of the number of eggs set out for incubation at the Chukhur-Kabalinskiĭ Factory, and 85% of the number incubated at the Chaĭkendskiĭ Factory. The initial results of rearing of the steelhead trout under the conditions of the Kura salmon factories have shown that this species grows considerably more rapidly and shifts to the down-wandering stage earlier than the Kura salmon. Observations will have to be made in the Caspian Sea and the Kura River to determine the success of acclimatization.

17386. Post, George, Dean V. Power, and Thomas M. Kloppel (Colorado State Univ., Fort Collins, Colo. 80521). 1973. EFFECT OF PHYSICAL SHOCK ON DEVELOPING SALMONID EGGS. Trans. Amer. Nuclear Soc., 17: 27-28.

Results of laboratory experiments indicate that ground motions in the range and character of those experienced from nuclear detonations at close-in distances would not have a significant effect on survival of rainbow trout eggs in natural redds due to shock effects alone. Eggs of Salmonid species other than rainbow trout would be expected to react similarly to physical shock.

17387. Abram, F. S. H. (Dept. of the Environ., Stevenage, Hertfordshire, England). 1973. APPARATUS FOR CONTROL OF POISON CONCENTRATION IN TOXICITY STUDIES WITH FISH. Water Research, 7(12): 1875-1879; Marine Fisheries Abstracts, 27(3): p. 22.

One of the major problems in controlling an experimental environment, in laboratory studies of toxicity of water pollutants, is that of maintaining the concentration of the toxic agent at the required level. The author has devised a system for providing a controlled variation in the concentration of poison, for dosing different poisons alternatively, and for dosing a variable mixture of poisons. Such devices have been reported previously, but they operated either on the power furnished by hydrostatic force or electrical motors and valves. The apparatus described in this report is operated pneumatically and therefore avoids the problems of electrical control near wet materials and retains the reliability of pneumatic operation. The system involves the filling and emptying of 500-ml measuring cylinders with water and simultaneously incorporating a quantity of poison from a concentrated stock solution. The apparatus consists essentially of 14 aquaria, each of 40-liter capacity, and each equipped with its own dosing unit. Each dosing unit consists of a 500-ml measuring cylinder with required tubing, valves, and syringes to provide the necessary metering for precise control of concentrations of poison entering the aquarium. The pneumatic system consists of pressurizers, pressure regulators, and valves that control the pneumatic power of the metering system. The apparatus works reliably for long periods with a satisfactory degree of accuracy. The overall concentrations delivered were 99% of the nominal value plus or minus 6%. Diagrams of the apparatus are shown.

17388. Soivio, Antti, Keijo Nyholm, and Kai Westman (Div. of Physiol. Zool, Dept. of Zool., Univ. of Helsinki, Helsinki, Finland). 1973. NOTES ON HAEMATOCRIT DETERMINATION ON RAINBOW TROUT, Salmo gairdneri. Aquaculture, No. 2, pp. 31-35.

Changes in haematocrit values in anaerobically and aerobically treated blood samples of rainbow trout (Salmo gairdneri) have been studied in vitro. The haematocrit value of blood kept under anaerobic conditions, e.g. in haematocrit capillaries, increased very rapidly, by about 25%, during the first hour. When the sample was oxygenated its haematocrit value decreased again to its original level. The increase may result from cellular swelling, caused by an increase in the CO_2 tension of the blood due to cellular respiration. (Authors)

17389. Harris, Graham P., and John N. A. Lott (Dept. of Biol., McMaster Univ., Hamilton, Ontario, Canada). 1973. LIGHT INTENSITY AND PHOTOSYNTHETIC RATES IN PHYTOPLANKTON. J. Fish. Res. Board Can., 30(12): 1771-1778.

The physiological behavior of various phytoplankton species has been examined under increasing and decreasing light regimes. A marked asymmetry has been found, with photosynthesis rates under rising light intensities exceeding those under dimming lights. Photo-inhibition has been observed at moderate light intensities (0.4-1.0 ly/min). Variations in the asymmetry and in photo-inhibition appear to be correlated with the light regimes experienced by the population. Under constant illumination by full sunlight a steady decrease in the photosynthesis rate was observed. As a result of photosynthesis measurements in fluctuating light regimes there is now evidence for photorespiration as the controlling mechanism. Data are presented which show that prolonged exposure to high light has an adverse effect on photosynthesis and indicate that ^{14}C moored bottle experiments may show reduced surface rates because of this. (Authors)

17390. Shaw, Evelyn, John Allen and Richard Stone. 1974. NOTES ON COLLECTION OF SHINER PERCH, Cymatogaster aggregata, IN BODEGA HARBOR, CALIFORNIA. Calif. Fish and Game, 60(1): 15-22.

During the summer of 1971, we recorded the distribution and reproductive condition of Cymatogaster aggregata, found in Bodega Harbor. Adults were abundant during June and early July, declining in August, with a simultaneous numerical increase of young of the year. Adults were primarily found in the environs of Gaffney Point and young of the year were primarily found at Spud Point and the environs of Doran Beach. Gravid females were found during the early part of the summer as were males with freely flowing seminal fluid. During the late summer the females were inseminated and seminal fluid was absent in many adult males. Patterns of distribution in relation to reproductive condition are discussed.

17391. Chew, Robert L. (Eustis Fish. Res. Lab., Florida Game & Fresh Water Fish Comm., P. O. Box 1903, Eustis, Florida 32726). 1973. THE FAILURE OF LARGEMOUTH BASS, Micropterus salmoides floridanus (LeSueur), TO SPAWN IN EUTROPHIC, OVER-CROWDED ENVIRONMENTS. Proc. of 26th Ann. Conf. Southeastern Assn. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 306-319.

Nonreproductive populations of adult largemouth bass have been found in a number of lakes. In all cases, these environments are characterized as highly eutrophic and over-crowded with bream and forage species. Reproductive failure was demonstrated to be due to a refusal of the adult population to spawn. Ripened ovaries were retained long after the spawning season and the deteriorated ova eventually reabsorbed. In some cases, only a portion of the adult largemouth bass population spawned, yet produced substantial yearclasses. Reproductive inhibition was attributed to the excretion and build up of a hormone-like repressive factor by over-crowded bream and forage species. Largemouth bass reproduction was induced by Human Chorionic Gonadotrophin injections in at least 1 and perhaps 2 nonreproductive lakes. Eutrophic, over-crowded conditions, identical to those found in non-productive lakes, were created in four hatchery ponds. Stocked pairs of largemouth bass failed to spawn in a manner identical to that in non-reproductive lakes. (Auth.)

17392. McConnell, William J., and George F. Adams (Colorado Coop. Fish. Unit, Colo. State Univ., Fort Collins, Colorado 80521). 1973. EMORY OAK (Quercus emoryi) LITTER PHENOLICS AS ENVIRONMENTAL HAZARDS FOR AQUATIC ANIMALS IN SOUTHEASTERN ARIZONA. Ariz. Acad. Sci., 8(3): 98-115.

Fifteen phenolic compounds present in water extracts of litter of Emory oak (Quercus emoryi) did not cause a discernable toxic response during 20-30 day exposures by 3 kinds of aquatic animals common in southeastern Arizona at 20 mg/l gallotannin equivalent. This concentration probably represents an unusually high, but occasionally attainable, natural concentration of total phenolics. A conifer phenolic flavonoid (taxifolin) closely similar to the oak phenolic quercetin depressed reproduction and/or survival of Daphnia pulex populations. (Authors)

17393. Bühringer, Helmut (Isotope Lab. of the Fed. Res. Inst. for Fishery, Hamburg, Germany). 1973. RADIATION SENSITIVITY OF THE RAINBOW TROUT (Salmo gairdneri Rich.) DURING EMBRYONAL- AND LARVAL DEVELOPMENT. [Strahlensensibilität der Regenbogenforelle (Salmo gairdneri Rich.) wahrend der Embryonal- und Larval-entwicklung]. Arch. Fischereiwiss., 24(1-3): 51-64. In German with English summary.

Fertilized eggs of the rainbow trout, at various stages of development, were irradiated once with a dose of 44 R to 2500 R X-rays. The same doses, at various times, were also applied during the larval development and juvenile stages. This showed that the sensitivity to radiation decreased, with the increasing age of the embryos, over the larval age to the juvenile stage. During this development period, however, particularly sensitive stages could be recognized. The characteristics of the damage are shown and described. Histological sections from the eyes of damaged trout give information of their optical ability, and reveal, at the same time, if the damage can be reversed. (Auth. summ.)

17394. Evans, Wallace A., and Richard A. Heckmann (Brigham Young Univ., Provo, Utah 84602). 1973. THE LIFE HISTORY OF Sanguinicola klamathensis. Life Sciences, Vol. 13, pp. 1285-1291.

The life history of the trematode blood fluke, Sanguinicola klamathensis was studied using experimentally infected cutthroat trout (Salmo clarki) and by examining wild salmonid populations. This study was carried out at the Hagerman National Fish Hatchery, Idaho, during 1971-1973. Ova, miracidia, sporocysts, cercariae, immature flukes, and adult flukes were measured, described, and photographed. A life cycle for the blood fluke is presented. (Authors)

17395. Kinumaki, Toyosuke, Kisaburo Sugii, Haruka Iida, and Tsutomu Takahashi 1972. ADDITION OF FAT SOLUBLE VITAMINS TO THE FEEDING STUFFS FOR PARENT RAINBOW TROUT WITH PARTICULAR REFERENCE TO THE EFFECT ON THE VITAMIN LEVELS OF EGGS AND FRY. Bull. Tokai Reg. Fish. Res. Lab., No. 71, pp. 133-160. In Japanese with English abstract and tables.

Feeding experiments with parent rainbow trout were performed at Fuji Hatchery, Shizuoka Prefecture, for the purpose of obtaining information about the suitable levels of fat soluble vitamins which should be contained in the diets for parent fish and fry. No deposition of vitamin A was observed in the parent fish fed with the basal test diet containing 800 I. U. per 100 g diet. However, vitamin A was remarkably accumulated in the body of fish and was concentrically distributed to liver and other viscera when more than 10,000 I. U. was fed with 100 g of the test diet. Vitamin D was deposited in the bodies of all fish receiving the diets which contained 46-200,000 I. U. of vitamin D per 100 g, but the rate of accumulation decreased from 92 to 0.8% as the dose increased. No deposition of vitamin E was observed in the parent fish fed with the diet containing 3 mg of vitamin E per 100 g. There was deposition of vitamin E in the doses from 10 mg to 1,000 mg per 100 g diet, and the rate of accumulation of the vitamin did not change greatly according to the dose. Vitamin A levels in matured eggs were 0.70-4.70 I. U. per egg and the level was higher in eggs of the parent receiving larger amounts of vitamin A. Vitamin D levels in matured eggs were 0.15-0.71 I. U. per egg and the difference of the level was little among groups receiving various amounts of vitamin D. Vitamin E levels in matured eggs were 4.4-5.1 μg per egg in the group deficient in vitamin E and were 21.5-35.4 μg per egg in other groups receiving large amounts of vitamin E, respectively. (From Authors' abstract)

17396. Reichert, William L., and Donald C. Malins (Environ. Cons. Div., NW Fish. Center, NOAA, Seattle, Washington). 1974. INTERACTION OF MERCURIALS WITH SALMON SERUM LIPOPROTEINS. Nature, 247(5442): 569-570.

It has been demonstrated that inorganic mercury ($^{203}HgCl_2$) and organic mercury ($CH_3{}^{203}HgCl$) compounds readily bind with the major classes of serum lipoproteins of sockeye salmon (Oncorhynchus nerka). The role played by lipid in these interactions is discussed here in reference to data obtained with a $CHCl_3$:H_2O model system.

17397. Kirpichnikov, V. S., and K. A. Faktorovich (Gosudarstvennyĭ Nauchno-Issledovatelskiĭ Inst. Ozernogo i Rechnogo Rybnogo Khozyaĭstva, Leningrad, USSR). 1972. INCREASE OF RESISTANCE OF CARP TO DROPSY BY MEANS OF BREEDING. II. COURSE OF SELECTION AND EVALUATION OF THE BREED GROUPS. Genetika, 8(5): 44-54, in Russian with English summ.; Selected Water Resources Abstracts, 7(3): p. 76.

The breeding of carp for the resistance to dropsy in the Krasnodar Territory (USSR) was in progress for 8 yrs. Breeding procedures were performed with 3 breed groups: Ropshian carps possessing a considerable proportion of genes from the gene pool of Amur wild carp in their genome, local scattered carps and the hybrids of the Ropshian and the Ukranian carps. During breeding procedures, the Ropshian carps underwent selection for dropsy resistance through 2 generations, while all the other breed groups underwent it in 1 generation. Hybrids between the Ropshian carp and the local scattered carps proved best with respect to growth rate and resistance to dropsy, while the scattered carps were the worst. Fairly good results were obtained with hybrids between the Ropshian and the Ukranian carps. The good characteristics of the inter breed hybrids suggest the urgency of future parallel breeding work with 2 or 3 breed groups with the subsequent use of the heterotic interbreed hybrids for commercial purposes. -- Biological Abstracts, Inc.

17398. Brown, Eric R., James J. Hazdra, Louis Keith, Irving Greenspan, J. B. G. Kwapinski, and Parker Beamer (Dept. Microb., The Chicago Med. School, Univ. Health Sci., Chicago, Illinois). 1973. FREQUENCY OF FISH TUMORS FOUND IN A POLLUTED WATERSHED AS COMPARED TO NONPOLLUTED CANADIAN WATERS. Cancer Research, 33: 189-198; Fish Health News, 3(1): p. 6.

Data are presented on the incidence of tumors found in 2121 fish examined from the Fox River watershed (4.38%) as compared to 4639 fish examined in Canada (1.03%). The water systems were compared as to pollution potentials, and the Fox River was found to be a highly polluted system. Among the pollutants found were mercury, lead, arsenic, toluene, crude oil, gasoline, benzanthracene, chlorinated hydrocarbons, phosphates, sulfates, and coliform bacteria. Factors such as dissolved oxygen content, temperature, and nutritional variation were considered similar in both water systems. It is concluded that these pollutants were responsible for the greater frequency of tumors. No attempts were made to determine the effects of pollution on the long-term human users of the water or to determine the virus contents of the water system under study. Plans are now being made to study the waters for fish viruses and, incidentally, those enteric viruses that one might expect in a river system that is termed "a floating sewer". (Authors' summ.)

17399. Symons, P. E. K., and G. D. Harding (Biol. Sta., Fish. Res. Board Can., St. Andrews, New Brunswick, Canada). 1974. BIOMASS CHANGES OF STREAM FISHES AFTER FOREST SPRAYING WITH THE INSECTICIDE FENITROTHION. Fish. Res. Board Can. Technical Report No. 432, 47 p. and appendices. Manuscript Status.

Early summer increases in biomass (total wet weight in grams/square meter) of fish and salamanders in three streams sprayed with fenitrothion at 140-210 g/ha (2-3 oz/acre) averaged 1.82 g/m^2 in four to five weeks, which was less than the average increase in two unsprayed control streams (4.30 g/m^2). When most insects were killed by trickling fenitrothion into a section of one stream for 24 hr at concentrations not lethal to fish, biomass of fish decreased in 5 weeks by 5.9 g/m^2. In this study, therefore, the forest spray program had an apparent short-term effect on fish biomass of 24% (range 3% to 45%) of that caused by a near total kill of the fish's insect food. (Authors)

17400. European Inland Fisheries Advisory Comm., FAO (Rome, Italy). 1973. SYMPOSIUM ON THE MAJOR COMMUNICABLE FISH DISEASES IN EUROPE AND THEIR CONTROL. PANEL REVIEWS AND RELEVANT PAPERS. EIFAC Technical Paper No. 17, Supplement 2, 255 p., edited by William A. Dill, 730 North Campus Way, Davis, California 95616.

17401. Itzkowitz, Murray (Dept. of Zool., Univ. of Maryland, College Park, Maryland). 1974. THE EFFECTS OF OTHER FISH ON THE REPRODUCTIVE BEHAVIOR OF THE MALE Cyprinodon variegatus (PISCES: CYPRINODONTIDAE). Behaviour, 48(1-2): 1-22.

This study was conducted to investigate the effects of both inter- and intraspecific intruders on the reproductive behavior of Cyprinodon variegatus. Field observations suggested that the highly aggressive male Cyprinodon prefer to chase their own species, then Fundulus heteroclitus, followed by Lucania parva and Gambusia affinis last. In a series of laboratory experiments, in which dominant males were given various combinations of uni-specific and hetero-specific groups to chase, strong evidence was produced for the chase preferences predicted from field observations. The effects of intruders on the spawning behavior of the male were also recorded. In the field the female entered the male's territory, spawned an average of four times and then left. A female spent approximately 20 seconds in the male's territory. While other fish did interrupt spawning, only neighboring territorial males actually interfered physically. This interference occurred if the spawning pair ventured too close to the border (approximately seven cm). In the laboratory conspecific intruders significantly reduced both the number of spawns and the total duration of contacting (i.e., a side-by-side position of the pair, occurring just before spawning). These intruders also increased the probability of long spawning intervals following other long intervals. At the same time, intruders caused the pair to produce relatively more short intervals. Thus, when other Cyprinodon males were present, the pair had a tendency to perform a clustering of spawns which was separated by several long intervals. This resembled the field situation in which a female entered, spawned several times and quickly left. This study suggests that the effects of other interacting fish should be considered when analyzing reproductive behavior. The observation of laboratory fish in isolated pairs may produce misleading results as to the evolution and/or maintenance of behavior. (Auth. summ.)

17402. Graynoth, E., and W. Skrzynski (Fish. Mgmt Div., Ministry of Agric. and Fish., Wellington, New Zealand). 1973. THE SOUTH CANTERBURY TROUT AND SALMON FISHERY. N. Z. Ministry of Agric. and Fish., Fisheries Technical Report No. 93, 47 p.

This report describes the trout and salmon fisheries of South Canterbury Acclimatisation District. It is based on angling results collected since 1947 by eight angling diary schemes. Over the past twenty years the popularity of angling has doubled. The average Men's Whole Season License holder fishes for about 20 days per season to catch 17 fish. The total district effort is about 100,000 days and the total catch 60,000 fish per season. There has been little historical change in the brown and rainbow trouts' and quinnat salmon's geographical distribution, size caught by anglers and probably numbers. The anglers' crop of fish is estimated to be a small proportion of the natural stock. A comparison of anglers' catches and fish sampled from the rivers shows that anglers' catch is a fairly representative proportion of the population above 25 cm. The seven principal waters and anglers' catches are described. The size limits imposed are too stringent but the bag limits have little effect. Comments are made on future fisheries management. (Authors' summ.)

17403. Wall, Benjamin R., Jr., and James D. Williams (Biol. Dept., Walker College, Jasper, Alabama 35501). 1974. Etheostoma boschungi, A NEW PERCID FISH FROM THE TENNESSEE RIVER DRAINAGE IN NORTHERN ALABAMA AND WESTERN TENNESSEE. Tulane Stud. Zool. Bot., 18(4): 172-182.

Etheostoma boschungi, the slackwater darter, is described from 110 specimens taken from second and third order streams in the southern bend of the Tennessee River. It appears to be an eastern representative of a species group whose other members, E. punctulatum, E. cragini, and E. pallididorsum, are found in western drainages of the Mississippi River Basin. E. boschungi differs from its western relatives in details of pigmentation, squamation, and osteology. (Authors)

17404. Beiningen, Kirk T. (Fish Comm. of Oregon, Clackamas, Oregon 97015). 1973. A MANUAL FOR MEASURING O_2 AND N_2 IN WATER. Fish Comm. of Oregon, 49 p.

Of the several methods used to determine concentrations of dissolved atmospheric gases in water, the modified Van Slyke-Neill blood gas analyzer is one of the most reliable. In recent years it came into wide use in the Pacific Northwest when gas bubble disease was found to be a factor in losses of salmon and steelhead trout migrating between dams on the Columbia River. This manual is designed to assist in training an operator to become proficient in analyzing water samples for gas supersaturation studies. Included are detailed procedures for installation, operation, preparation of chemicals, and analysis. A separate section discusses the results of analysis in detail. Data treatment includes several methods of interpretation (ml/liter, mg/liter, percentage of saturation, and partial pressure) familiar to biologists, oceanographers, and limnologists alike. Tables are provided to assist in rapid conversion of data. Calculations of total gas partial pressure and altitude correction are given. Supplemental information is provided on field sampling procedures, a shortened modification of the Winkler DO method, basic gas law equations, helpful references, and a detailed list of required equipment. (Auth.)

17405. Valentine, David W., and Michael Soule (Dept. of Biol., Univ. of Calif., San Diego, La Jolla, California 92037). 1973. EFFECT OF p,p'-DDT ON DEVELOPMENTAL STABILITY OF PECTORAL FIN RAYS IN THE GRUNION, Leuresthes tenuis. NOAA Fish. Bull., 71(4): 921-926.

Experiments are described that test the validity and utility of using bilateral asymmetry for the early detection of environmental deterioration. The first experiment, using a continuously flowing water system, was designed to test the effects of a ubiquitous pollutant, p,p'-DDT, on the pectoral fin ray asymmetry of grunion, Leuresthes tenuis, fry. Toxicant concentrations ranged from a low of 0.001 to a high of 500 parts per billion. The two highest p,p'-DDT concentrations, 100 and 500 parts per billion, proved lethal to grunion fry. For the other concentrations, increases in pectoral fin ray asymmetry with increasing toxicant concentration were observed. Increases in asymmetry were statistically significant. The second experiment, which utilized a recirculating static water system, was designed to determine inherent differences in the level of pectoral ray fin asymmetry in fish from different localities. Results for grunion fry paralleled previously published results for adult grunion. Grunion from the relatively polluted southern California region had higher asymmetry levels than did those from Baja California. The significance of these results as they relate to the general question of asymmetry as a statistical indicator of environmental stress is discussed. (Authors)

17406. Schwartz, Frank J. (Univ. of No. Carolina, Inst. of Marine Sciences, Morehead City, No. Carolina 28557). 1973. AN ASSESSMENT OF EGG, LARVAL, AND JUVENILE FISH RESEARCH NEEDS AND PROBLEMS, WITH COMMENTS ON RESEARCH AT THE UNIVERSITY OF NORTH CAROLINA INSTITUTE OF MARINE SCIENCES. Proc. of a Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Middle Atlantic Coastal Fisheries Center, Technical Publication No. 1, pp. 7-11.

Sampling problems experienced by all researchers who deal with eggs, larvae, and juveniles of marine fishes are reviewed. Technical problems involving sampling gear, field facilities, and personnel, as well as standardization of sampling methods and literature retrieval, are of primary importance. (Auth.)

17407. Thorson, Lee C., and Mary Ellen Engett (Sci. Publications Staff, NMFS, Seattle, Washington). 1973. FISHERY PUBLICATIONS, CALENDAR YEAR 1972: LISTS AND INDEXES. NOAA Technical Report NMFS CIRC-385, 23 p.

The following series of fishery publications of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, in calendar year 1972 are listed numerically (with abstracts) and indexed by author, subject, and geographic area: NOAA Technical Report NMFS CIRC (formerly Circular); Data Report; Fishery Facts; NOAA Technical Report NMFS SSRF; and NOAA Technical Memorandum NMFS. (Authors)

17408. Ghittino, P. and J. B. Gratzek (Visiting Prof., The Univ. of Georgia, Athens, Georgia 30602). 1973. PRESENT KNOWLEDGE ON CHANNEL CATFISH VIRUS DISEASE (CCVD). Riv. It. Piscic. Ittiop., 8(3): 65-70.

The authors review the current knowledge of Channel Catfish Virus Disease (CCVD), a serious problem which recently was described in farmed catfish in several southern states of the U.S.A. CCVD threatens this form of warm water fish farming, which in the past decade has played an important role in the field of modern aquaculture. The disease is described including its nomenclature, occurrence, identification, etiology, transmission, pathogenesis, incubation and control. CCVD is a contagious, dangerous, acute disease which can cause high mortality (95%) in farmed fry and fingerling channel catfish during summer months. Its diagnosis is primarily based on the isolation of the responsible etiologic agent, the Channel Catfish Virus (CCV), from dead fish. CCV is a herpesvirus which grows on brown bullhead (BB) cell lines where it induces characteristic intranuclear inclusions and syncytium formation. A diagnosis of past infection may also be achieved by tests for CCV antibody in the sera of adult surviving fish. Since a vertical transmission through the sexual products of carrier fish has been speculated, virus neutralization tests may be an important tool for the control of the disease. Experimental transmission has been done in different ways and the incubation period depends on water temperature (at 30°C = 37-72 hr.; at 20°C = 10 days). Since CCVD is incurable, serious campaigns must be undertaken to eradicate and prevent it. Direct prevention will depend on the establishment of controls governing eradication programs and by the certification of Specific Pathogen Free (SPF) channel catfish farms. (Authors)

17409. Wiggins, Glenn B. 1973. CONTRIBUTIONS TO THE SYSTEMATICS OF THE CADDISFLY FAMILY LIMNEPHILIDAE (TRICHOPTERA). I. Life Sci. Contr. R. Ont. Mus. No. 94, 32 p.

Several genera of limnephilid Trichoptera occurring in western North America are particularly significant in the phylogeny and classification of the family because of their ambiguous relationships with other taxa. This paper provides new data from larval and pupal morphology for certain of these critical genera: Imania (scotti sp. nov.), Manophylax gen. nov. (annulatus sp. nov.) and Moselyana (comosa Denning). Adults of these species are also described, along with all stages of a species of Apatania (arizona sp. nov.). Preliminary assessment of ancestral and derived characters is made for the larvae of the Limnephilidae. Using these criteria, analysis of larval characters is made for the limnephilid subfamilies and for the genera Moselyana, Imania, and Manophylax. The analysis indicates that these three genera are not congruent with any of the subfamilies as now constituted, including the Apataniinae with which the two former genera have been classified. The analysis further indicates that larvae of Imania and Moselyana have few derivative characters in common, suggesting that these two genera are not as closely related as has been interpreted from the adults. (Auth.)

17410. Novotny, Donald W., and Gordon R. Priegel. 1974. ELECTROFISHING BOATS. IMPROVED DESIGNS AND OPERATIONAL GUIDELINES TO INCREASE THE EFFECTIVENESS OF BOOM SHOCKERS. Dept. of Nat. Resources, Madison, Wisconsin, Technical Bull. No. 73, 48 p., illus.

The first segment of this manuscript presents basic concepts and design guidelines for electrofishing boats including a summary of problem areas, descriptions of the basic aspects of electrical, safety, and electrode systems, and general design and operating guidelines. Experimental and operational ac-pulsed dc and ac electrofishing boats designed during the project are described in detail in the second segment. Electrofishing performance and operating guidelines based on actual field operation as well as design information on power supplies, controls and electrode systems are presented. Supporting information on electrofishing safety, calculation of electrode resistance, wiring diagrams, and lists of components used in the newly designed electrofishing boats are included in the appendixes. (Authors)

17411. Gengerke, T. W., D. G. Unkenholz, and J. G. Nickum (So. Dakota State Univ., Brookings, So. Dakota 57006). 1973. A MODIFICATION OF SEABURG'S STOMACH SAMPLER. Prog. Fish-Cult., 35(3): 142.

17412. Havey, Keith A. (Maine Dept. of Inland Fish. and Game, Machias, Maine 04654). 1974. EFFECTS OF REGULATED FLOWS ON STANDING CROPS OF JUVENILE SALMON AND OTHER FISHES AT BARROWS STREAM, MAINE. Trans. Amer. Fish. Soc., 103(1): 1-9.

Mean standing crop of 5 brood years of age 0+ salmon prior to regulation of stream flows was estimated for each kg of female spawners/ha. Estimate was 20.1 fish/ha weighing 0.035 kg. Mean standing crop of 5 brood years of age 0+ salmon for each kg of female spawners following flow regulation was 39.0 fish/ha weighing 0.088 kg. The estimates are not significantly different at the 95% confidence level but are at the 70% confidence level. Mean standing crop of 5 brood years of 10-15 cm age I+ salmon prior to regulation of stream flows was estimated for each age 0+ salmon/ha and for each kg of age 0+ salmon/ha of the same brood years. So measured each age 0+ salmon produced 0.0040 kg of age I+ salmon and each kg of age 0+ salmon produced 1.876 kg of age I+ salmon. For 4 brood years of 10-15 cm age I+ salmon following flow regulation each age 0+ salmon produced 0.0029 kg of age I+ salmon and each kg of age 0+ salmon produced 1.115 kg of age I+ salmon. Differences for before and after flow regulation are not significant at the 95% confidence level. Mean annual survival from age 0+ to 10-15 cm age I+ salmon prior to and following flow regulation was 18.69% and 19.61% respectively. The differences in survival are not significant at the 95% confidence level. Prior to water control, mean annual number of all fish except salmon was 3,775/ha while mean annual weight was 19.003 kg/ha. After water regulation mean annual number of all fish except salmon was 6,795/ha while mean annual weight was 21.504 kg/ha. Neither number nor weight differences are different at the 95% confidence level. Small fish tended to respond to the increased flows more than the larger fish. Some practical aspects of operation of small water control dams are discussed particularly the desirability of releasing additional water following large rains in dry seasons. (Auth.)

17413. Loch, J. S., and J. C. MacLeod (Resource Mgmt Branch, Fish. Operations Directorate, Central Region, Winnipeg, Manitoba, Canada). 1974. FACTORS AFFECTING ACUTE TOXICITY BIOASSAYS WITH PULP MILL EFFLUENT. Environment Canada, Fish. and Marine Serv. Tech. Report Series No. CEN/T-74-2, 31 p.

A study was conducted to assess the influence of some basic bioassay parameters on the 96 hour acute toxicity bioassay of pulp mill effluent using rainbow trout (Salmo gairdneri). Flow-through bioassays were found to be considerably more sensitive and replicable than static. Temperature of the bioassay influenced the acute toxicity measurement in that the higher the temperature, the greater the toxicity found. A minimum of a 96 hour exposure period was required for a proper assessment of the acute toxicity. Aeration by airstone did not reduce acute toxicity under flow-through conditions compared with non-aeration and oxygenation. The acute toxicity of pulp mill effluent was found to vary between mills even after secondary treatment. Effluent samples from one mill varied in acute toxicity between samples but the fluctuations were not excessive. (Authors)

17414. Toivonen, Jorma. 1972. RESEARCH ON LAKE KONNEVESI. (Konneveden tutkimus). Suomen Kalatalous, 46: 1-2. In Finnish.

In 1969 a team of workers commenced limnological and fish biological studies in Konnevesi, a lake in Central Finland belonging to the Rautalampi watercourse. Their aim is to collect information as comprehensive as possible on a large, untouched, oligotrophic lake. This material will be used as a basis for comparison in studies of the changes occasioned in other lakes by eutrophication and/or water level control and also in the development of methods for fishery management. (Auth.)

17415. Loring, D. H., and D. J. G. Nota (Dept. of the Environ., Fish. and Marine Serv., Marine Ecol. Lab., Bedford Inst. of Oceanog., Dartmouth, Nova Scotia, Canada). 1973. MORPHOLOGY AND SEDIMENTS OF THE GULF OF ST. LAWRENCE. Bull. 182 of the Fish. Res. Board Can., 147 p. + charts. Available by mail from Information Canada, Ottawa K1A 0S9, price $5.00.

17416. Harris, G. P. (Dept. of Biol., McMaster Univ., Hamilton, Ontario, Can.) 1973. DIEL AND ANNUAL CYCLES OF NET PLANKTON PHOTOSYNTHESIS IN LAKE ONTARIO. J. Fish. Res. Board Can., 30(12): 1779-1787.

Photosynthesis measurements on net plankton have been carried out for the period April, 1972 to January 1973 in Lake Ontario. The rising and falling light regimes used on the net phytoplankton (>64μ) give marked photosynthetic hysteresis effects in winter and in spring for diatom-dominated populations. Diel fluctuations in photosynthesis and "sun" or "shade" adaptations showed a close interaction between the phytoplankton and the surface light intensity. Systematic seasonal changes have been recorded in the magnitude of the photosynthetic hysteresis effect, saturation light intensities, compensation points, maximum photosynthesis, and respiration rates. An inverse correlation has been found between net plankton mean maximum photosynthesis rates and the rate of change of water temperature. Also phytoplankton respiration rate is largely a function of temperature. The data have been unified to give a picture of daily photosynthesis patterns at different depths in a static water column. The data compare well with ^{14}C moored bottle experiments. Predictive equations have been calculated for maximum photosynthesis rates at different times of the year. (Auth.)

17417. Holbrook, John A., II, Don Johnson, and Joseph P. Strzemienski (Georgia Coop. Fish. Unit, Athens, Georgia). 1973. MANAGEMENT IMPLICATIONS OF BASS FISHING TOURNAMENTS. Proc. of 26th Ann. Conf. Southeastern Assn. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 320-324.

This study was designed to assess the harvest of a bass fishing tournament and its effect on the bass population of a lake. The data evaluated here are taken from a total of 2254 largemouth bass weighing an estimated 4419.5 pounds harvested during a three day (29-31 March, 1972) bass fishing tournament held at Lake Lanier, Georgia, a 38,000 acre reservoir. Of the 794 bass sexed by excising gonads, 504 (63.5%) were females. The largest male measured 19.1 inches (3 lb., 11 oz.) while the longest female was 23.8 inches (7 lb., 4 oz.). Catch rates for the tournament were 0.25 fish per hour and 0.49 pounds per hour. Average bass weight was 1.9 pounds. Total harvest per acre during the tournament was estimated at 0.12 pounds. Cove rotenone samples from 1961-67 indicate bass standing crops from a 4.22-11.25 pounds per acre in Lake Lanier. Estimated yearly bass harvest (numbers) from four years of creel censusing (1962, 1965-67) ranges from 17,834 to 30,778. Catch rates computed from creel censuses indicated a range of 0.060-0.220 bass per hour. Ideas on the use of fishing tournament data in fisheries management are also presented. (Authors)

17418. Jackivicz, Thomas P., Jr., and Lawrence N. Kuzminski (Environ. Eng. Prog., Dept. of Civ. Eng., Univ. of Mass., Amherst, Massachusetts). 1973. THE EFFECTS OF THE INTERACTION OF OUTBOARD MOTORS WITH THE AQUATIC ENVIRONMENT - A REVIEW. Environ. Res., 6(4): 436-454.

The effects of the compounds associated with outboard motor subsurface exhausts on water quality and aquatic biota are reviewed. The problems affiliated with water quality may include the formation of undesirable tastes and odors and the appearance of oily substances. It has been demonstrated that outboard motor exhaust water can exhibit a toxic effect in sufficiently high concentrations to fathead minnows and bluegills, taints the flesh of various fish, and may affect the reproduction of fish. A discussion of the current research related to the effects of outboard motors on the aquatic environment is presented. Recommendations are given for future research to broaden the understanding of the interaction of outboard motors with the aquatic environment. (Authors)

17419. Suzuki, Akimi. 1972. TRANSFERRIN OF FISH - I. POLYMORPHISM OF TRANSFERRIN IN SEVERAL SPECIES OF FISH. Bull. Tokai Reg. Fish. Res. Lab., Tokyo, Japan, No. 72, pp. 21-33. In Japanese with figs., tables and abstract in English.

This report gives the results of electrophoretic investigation on serum transferrin in eighteen species of marine fish and cultured carp. (From Auth. abstract)

17420. Huschenbeth, E. (Inst. for Coastal- and Freshwater Fishery of the Fed. Res. Inst. for Fishery, Hamburg, Germany). 1973. ON THE ACCUMULATION OF CHLORINATED HYDROCARBONS IN FISH (Zur Speicherung von chlorierten Kohlenwasserstoffen im Fisch). Arch. Fischereiwiss., 24(1-3): 105-116. In German with English summ.

Analyses were carried out on 2250 fishes, crustaceans and bivalves to determine the accumulation of pesticides (DDT, TDE, DDE, lindane and dieldrin). Most of the investigated meagre fish of the North Atlantic, the North Sea and the Baltic had accumulated less than 0.1 ppm of DDT and metabolites. In fat fish, corresponding to the fat-solubility of these substances, higher values were found, most of them, however, not beyond 1.0 ppm. Only in salmon higher values were found. The PCB-values in the North Sea came up to 0.2 ppm in meagre fish, and to 1.3 ppm in fat fish. The few freshwater-fishes of the rivers Moselle, Elbe, Aller and Trave partly showed a considerably higher contamination by DDT and its metabolites. Some values came up to 6 ppm. Most of the fish species, however, had accumulated less than 1.0 ppm. In fresh-water fish the contamination by PCB's was slightly higher. The cod-liver containing much fat obviously serves as an organ to accumulate contaminants. Cod-liver of the central Baltic contained up to 57 ppm $\leq$ DDT. Even average values of about 30 ppm were determined. During the sterilization of cod-liver a large decrease of the DDT content was observed and a large increase of TDE together with a considerable total reduction of the $\leq$ DDT content. It was found that $\leq$ DDT in the cod-liver was reduced during cooking by more than 50%; during frying only by about 10%. (Auth. summ.)

17421. Cohen, J., A. Poinsard, and R. Scherrer (Inst. Nat. Recherche Agron., Sta. Recherches Virol. & Immunol., 78850 - Thiverval-Grignon, France). 1973. PHYSICO-CHEMICAL AND MORPHOLOGICAL FEATURES OF INFECTIOUS PANCREATIC NECROSIS VIRUS. J. gen. Virol., 21: 485-498; Fish Health News, 3(1): p. 7.

Infectious pancreatic necrosis (IPN) virus has been purified and some physico-chemical properties of its nucleic acid and protein moieties have been determined. The buoyant density of the virus particle in CsCl is 1.35 g/ml; degraded particle banded at a density of 1.31 g/ml. The virus nucleic acid was found to be double-stranded, according to several different criteria, namely resistance to pancreatic RNase, low density in $Cs_2 SO^4$ (1.615), sharp melting curve with a T_m of 89°C in hypotonic buffer, and base composition. In a sucrose gradient the bulk of the virus RNA banded as a single peak (14 S); a small part of the virus nucleic acid was found at the top of the gradient. By gel electrophoresis virus RNA was resolved into three peaks corresponding to doublestranded molecules with mol. wt. ranging from 2.85×10^6 to 2.55×10^6. Gel analysis of virus proteins revealed three polypeptides of mol. wt., 80, 50 and 30×10^3, representing respectively 3%, 68% and 29% of the total protein. On the basis of these results IPN virus appears to be related to some reo-like viruses, having a single protein shell and a single class of doublestranded RNA. (Authors' summ.)

17422. Rawstron, Robert R., and Robert A. Reavis. 1974. FIRST YEAR HARVEST RATES OF LARGEMOUTH BASS AT FOLSOM LAKE AND LAKE BERRYESSA, CALIFORNIA. Calif. Fish and Game, 60(1): 52-53.

First year exploitation rates of 0.47 at Folsom Lake and 0.58 at Lake Berryessa for Micropterus salmoides are at high levels. These values indicate pressure of a level that will decrease angling opportunities for this species in large California reservoirs. (Authors)

17423. Døving, Kjell B., Hans Nordeng, and Bruce Oakley (Inst. of Zoophysiol., Univ. of Oslo, Blindern, Oslo, Norway). 1974. SINGLE UNIT DISCRIMINATION OF FISH ODOURS RELEASED BY CHAR (Salmo alpinus L.) POPULATIONS. Comp. Biochem. Physiol., 47(3A): 1051-1063.

Dilute fish odours from four distinct char populations elicited differential responses from char olfactory bulb cells. Differential sensory responses produced by odours from migratory and non-migratory populations of char suggest that fish odours could act as pheromones which help guide homing in these salmonids. Skin mucous may well be the principal source of odorants released by the char. (Authors)

17424. Messinger, H. B., and H. T. Bilton (Fish. Res. Board Can., Pacific Biol. Sta., Nanaimo, British Columbia, Canada). 1974. FACTOR ANALYSIS IN DISCRIMINATING THE RACIAL ORIGIN OF SOCKEYE SALMON (Oncorhynchus nerka). J. Fish. Res. Board Can., 31(1): 1-10.

A comparison was made between the procedure of factoring variables before using them in discriminant analysis and the usual procedure of using the original variables in discriminant analysis. The results indicated factoring seven scale measurements on sockeye salmon (Oncorhynchus nerka) with varimax rotation produced four new variables which gave more valid results in classifying sockeye salmon by area of origin than the original variables when discriminant functions were computed. Although the results on the basic data from which the functions were derived were not as good using the four factor scores as the seven original variables, the accuracy of classification was much more consistent in the test data with the factor scores. The loss of accuracy was at least 2-1/2 times as great for functions based on the original variables as for ones based on factor scores. The errors in classifying fish to their individual places of origin were perhaps too large for the procedure to be useful in the field, but the accuracy of classification to the British Columbia or Alaska region was quite high. (Authors)

17425. Olla, Bori L., Allen J. Bejda, and A. Dale Martin (Sandy Hook Lab., Middle Atlantic Coastal Fish. Center, NMFS, NOAA, Highlands, New Jersey 07732). 1974. DAILY ACTIVITY, MOVEMENTS, FEEDING, AND SEASONAL OCCURRENCE IN THE TAUTOG, Tautoga onitis. NOAA Fish. Bull., 72(1): 27-35.

Observations were made on the activity and movements of adult tautog, Tautoga onitis, in their natural habitat using scuba and by monitoring the movements of individual fish by ultrasonic tracking. Results showed tautog to be active during the day and inactive at night. Fish larger than 30 cm moved out from the night resting place (home site) each day to feed, while younger fish (25 cm) remained and fed in close proximity to the home site. Examination of digestive tracts from various-sized fish showed the blue mussel, Mytilus edulis, to be the principal food for this population. While older fish appeared to move offshore for the winter, the younger fish remained inshore, wintering over in a torpid state. The significance of the tautog's differential responsiveness, food habits, and daily and seasonal movements are discussed. (Authors)

17426. Poston, Hugh A., and Richard N. DiLorenzo (Tunison Lab. of Fish Nutrition, U.S. Bur. of Sport Fish. & Wildl., Cortland, New York 13045). 1973. TRYPTOPHAN CONVERSION TO NIACIN IN THE BROOK TROUT (Salvelinus fontinalis). (37537). Reprint from Proc. Soc. Exp. Biol. and Med., 144(1): 110-112.

Data on growth, body composition and liver 3HAA and PC assays indicate that L-tryptophan is an inefficient precursor of dietary niacin for the brook trout. The brook trout has a high liver PC activity. While this enzyme activity, alone, indicates a high requirement for dietary niacin, the 3HAA/PC ratio is a more meaningful indicator of the efficiency of the tryptophan-to-niacin conversion in the brook trout and other species. An investigation of the PC and 3HAA activities of other salmonids should help elucidate interspecies and intergeneric variations in niacin requirements. (Authors' summ. and conclusions)

17427. Amin, Omar M. (Sci. Div., Univ. of Wisconsin- Parkside, Kenosha, Wisconsin). 1974. INTESTINAL HELMINTHS OF THE WHITE SUCKER, Catostomus commersoni (Lacépède), IN SE WISCONSIN. Proc. Helminthol. Soc. Wash., 41(1): 81-88.

Five species of helminths were recovered from the intestine of the white sucker, Catostomus commersoni (Lacépède), in southeastern Wisconsin. Hosts were seined in five sites in both the Root River (Milwaukee and Racine counties; autumn 1971) and the Pike River (Racine and Kenosha counties; autumn 1972). The helminths are Triganodistomum attenuatum Mueller and Van Cleave, 1932 (Trematoda: Lissorchiidae), new locality record; Biacetabulum macrocephalum McCrae, 1962 (Cestoda: Caryophyllaeidae), new state record; Biacetabulum biloculoides Mackiewicz and McCrae, 1965 (Cestoda: Caryophyllaeidae) new state record; Acanthocephalus dirus (Van Cleave, 1931) Van Cleave and Townsend, 1936, new host and

state record; Dorylaimus sp. (?) Dujardin, 1845 (Nematoda: Dorylaimidae), a nonparasitic nematode reported for the first time in this fish. Distribution, structural observations, and host-parasite relationships of the above species are discussed. (Auth.)

17428. Laurent, M., and J. Badia (Station d'Hydrobiologie, I.N.R.A., B. P. 79, 64200 Biarritz, France). 1973. COMPARATIVE STUDY OF THE NITROGEN LIFE-CYCLE IN THE PONDS. (Étude Comparative du Cycle Biologique de l'azote dans Deux Étangs). Ann. Hydrobiol., 4(1): 77-102. In French with English summ.

A comparative study of two ponds under very different ecological conditions has been carried out : physico-chemical measures, counting of bacterial germs in mud and in water during an annual cycle; nitrogen and nitrogenous compounds have been particularly studied. The interpretation of results is worked out by means of the classical analysis (graphs with months of the year on the X-axis and values of measured factors on the Y-axis) and of the mathematical analysis (factor analysis and principal component analysis, factor analysis of correspondences, harmonic analysis). This work points out the opposition between the temperature and the number of ammonifying germs on one hand and the ammoniacal nitrogen content on the other hand. The existence of heterotrophous nitrification in muds is suggested. The mathematical analysis has enabled to work out a much finer interpretation of data than the classical analysis, for showing the opposition between ammonifying germs and ammoniacal nitrogen as well as for heterotrophous nitrification; it seems necessary for studying seasonal variations of ecological factors in natural environment. (Authors' summ.)

17429. Kristoffersson, Rolf, Saara Broberg, and Aimo Oikari (Div. of Physiol. Zool., Dept. of Zool., Univ. of Helsinki, Helsinki, Finland). 1973. PHYSIOLOGICAL EFFECTS OF A SUBLETHAL CONCENTRATION OF PHENOL IN THE PIKE (Esox lucius L.) IN PURE BRACKISH WATER. Ann. Zool. Fenn., 10(2): 392-397.

The effect of phenol on pike (Esox lucius L.) living in brackish water of relatively stable salinity, 5-6 ‰, was studied in continuous-flow aquarium experiments. The highest concentration for survival for at least one week was found to be 5 ppm of phenol at a water temperature of 10°C. Longer periods were not tested. This concentration produced the typical effects of phenol on activity, which lasted for the first 2-3 days. After one week's exposure, the test fish were still in good condition, as judged from their external appearance. No differences could be demonstrated between the control and phenol-affected groups in blood haemoglobin, haematocrit, total plasma protein, Na^+, K^+, Ca^{2+}, Mg^{2+} or Cl^- values. The total amount of plasma free amino acids was slightly increased in the phenol-affected group. Significant changes in individual amino acids are reported but their value as indicators of phenol action remains obscure. No clearly destructive histopathological changes in the gill lamellae or liver structures of the phenol-affected group could be detected. (Authors)

17430. Rousseau, Armand (Inst. Nat. de la Rech. Sci., INRS-Eau, Quebec, Canada). 1973. DAILY FALL ACTIVITY AND DIRECTION OF MOVEMENTS OF FISH IN LAKE QUENOUILLE IN THE LAURENTIANS (Activite Automnale Journaliere et Direction du Mouvement des Poissons au Lac Quenouille dans les Laurentides). Rev. Can. Biol., 32(4): 233-239.

A knowledge of the circadian rhythms of fish and their displacement patterns is important for the pursuit of fish population studies and for the rational management of fishery resources. A study of Lake Quenouille (a small warm shallow water lake in Quebec), involving gill net fishing during four consecutive weekends, has led to the following observations: the yellow perch (Perca flavescens) and the pumpkinseed (Lepomis gibbosus) are diurnal fishes exhibiting maximal activity from 8 to 9 hr and 9 to 11 hr respectively; the brown bullhead (Ictalurus nebulosus) is nocturnal, exhibiting maximal activity between 22 hr and 2 hr. A study of fish displacement with respect to the shoreline was 68-69° for the yellow perch and pumpkinseed, and 90° for the brown bullhead.

17431. Kudo, Shigeharu, Dan Kurosawa, Issei Kunimine, Kunihiro Nobusawa, and Shigeru Kobayashi (Dept. of Anat., School of Med., Gunma Univ., Maebashi-shi, 371, Japan). 1973. ELECTRON MICROSCOPIC OBSERVATIONS OF THE PANCREAS AND LIVER IN THE FINGERLING RAINBOW TROUT WITH SYMPTOMS OF IPN. Jap. J. Ichthyol., 20(3): 163-177. In Japanese with Eng. abstract & figs.

The histo- and cyto-pathological changes in the exocrine portions of the pancreas and in the liver were observed in the fingerling of the infected rainbow trout (Salmo gairdneri Richardson). Symptoms of the trouts suffering from infectious pancreatic necrosis (IPN) disease are the dark coloration, exophthalmos, and acites. Although the extent of the necrotic or degenerated lesions in the cytoplasm of the pancreatic acinar cells was different from cell to cell, a number of cells displayed one, several, or all of the following structures in the cytoplasm: myelin-figured lysosomes with often intermingled virions; necrotic degeneration of zymogen granules; and flattened layered cisternae of rough endoplasmic reticulum accompanied with loss of ribosomes; grouped virions; cytolysomes containing several of the myelin-figured electron dense material, virions, cell organelles, fine filaments, winding membranous structures; and clear zymogen granules containing a flocculent material. In more advanced and the most advanced cases, there appeared pycnotic nuclei of the acinar cells, cellular detritus, degenerated cell organelles such as mitochondria which are often scattered in the intercellular space, and in the exocrine portions there appeared some regions electron-microscopically indistinguishable from each other by fusion of several acinar cells. Also in the hepatocytes pathologically displayed cytoplasmic structures were almost similar to those of the acinar cells except degeneration of zymogen granules. However, the extent of necrotic lesions of the hepatic tissue was small, so far, as compared with the pancreatic tissue in one and the same individual, and a heavy destruction of the acinar cells in several regions of the pancreatic tissue was accompanied with the beginning of the necrotic degeneration of hepatocytes with accumulations of fat droplets different in size and increase of lysosomes. In the pancreatic and hepatic tissues of IPN disease infiltration of macrophages and two or polymorphonuclear wandering cells was conspicuous, and these cells and Kupffer's stellate cells contained a large number of lysosomes and one to three cytolysomes. The majority of virions in the pancreatic acinar cells, hepatocytes, wandering cells and Kupffer's stellate cells appeared in lysosomes and cytolysomes identified with the intracytoplasmic inclusions by light microscopy, in which virions became indistinct in profile and were destroyed to transform electron dense myelin-figured and finely granular materials. Round, oval, or baciliform materials occupied by an electron dense myelin figure alone were often discharged into the intercellular space. In ultra-thin sections, virions (size range of 50-60 mμ, average diameter of 54.3 mμ) appeared unenveloped, and hexagonal to round in appearance. The virus perhaps is IPN virus and may belong morphologically to reovirus group in comparison with the observations by Moss and Gravell (1969). Near the virions of various numbers, two kinds of rod-like bodies having an average diameter of 60 mμ and 28 mμ often appeared setting in parallel array or crossing in irregularity, respectively. The end of the rod-like bodies often showed roundness, and the transverse sections of them showed a round shape and tubular structures exhibiting a clear central portion.

17432. Holčik, Juraj, and Karel Pivnička (Lab. of Fish. Res., Slovak Acad. of Agric. Sci., Bratislava, Czechoslovakia). 1972. THE DENSITY AND PRODUCTION OF FISH POPULATIONS IN THE KLIČAVA RESERVOIR (CZECHOSLOVAKIA) AND THEIR CHANGES DURING THE PERIOD 1957-1970. Int. Revue ges. Hydrobiol., 57(6): 883-894.

The results of 14 years of observations are reported concerning the species composition, ichthyomass (standing crop), total and available production, harvestable yield and balance of the fish population in the Kličava reservoir (67 ha of area) in Central Bohemia. Two stages of the reservoir development with regard to its fish are recognized and characterized. Some phenomena concerning the course of the ichthyomass and production, and the reasons for their fluctuations are discussed. (Authors)

17433. Brett, J. R. (Fish. Res. Board Can., Pacific Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1973. ENERGY EXPENDITURE OF SOCKEYE SALMON, Oncorhynchus nerka, DURING SUSTAINED PERFORMANCE. J. Fish. Res. Board Can., 30(12): 1799-1809.

Fingerling and adult sockeye salmon (Oncorhynchus nerka) were subjected to long periods of sustained swimming (10-20 days) in air-saturated fresh water. Energy expended was computed from change in body composition and compared with the metabolic equivalent from multiple determinations of oxygen-consumption rate. Caloric loss from body substance exceeded that estimated from total oxygen uptake by an average of 19.8%. The reasons for the difference, and the assumptions involved, are discussed. The difference apparently arises from slight excretion of partially metabolized fuels (anaerobic metabolism) and loss from sloughed body tissues. An oxycalorific equivalent of 4.8 kcal/liter O_2 is considered an acceptable value for fish. (Auth.)

17434. May, B. E. (Florida Game and Fresh Water Fish Comm., Eustis, Florida 32726). 1973. EVALUATION OF LARGESCALE RELEASE PROGRAMS WITH SPECIAL REFERENCE TO BASS FISHING TOURNAMENTS. Proc. of the 26th Ann. Conf. Southeastern Assn. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 325-334.

A study was conducted to assess the effectiveness of an extensive release program conducted in conjunction with the B.A.S.S. (Bass Anglers Sportsman Society) Tournament held on Lake Kissimmee and adjoining lakes, Osceola County, Florida. Largemouth bass (Micropterus salmoides) caught by tournament participants were to be released into Lake Kissimmee following weighing and counting by tournament officials. Fish in poor condition and mortalities incurred prior to release were included into an initial mortality estimate of 15.6% by number and 13.7% by weight. A sample of fish to be released was taken and held for observation in anchored cages for 14 days to estimate delayed mortality resulting from hooking, handling, and related stresses. Control fish captured by non-angling methods were held simultaneously. Mortality incurred subsequent to release (delayed mortality) was estimated at 15.0% by number for a six day period. A total mortality estimate of 30% was projected to this particular tournament. A second study was initiated, under more controlled conditions, to evaluate bass survival over extended periods of time. Recommendations based on tournament observations and study findings were formalized to aid in future large scale release programs. (Auth.)

17435. Reynolds, William W., and Donald A. Thomson (The Pennsylvania State Univ., Wilkes-Barre Campus, Wilkes-Barre, Pa.). 1974. TEMPERATURE AND SALINITY TOLERANCES OF YOUNG GULF OF CALIFORNIA GRUNION, Leuresthes sardina (ATHERINIFORMES: ATHERINIDAE). J. Marine Research, 32(1): 37-45.

Temperature and salinity tolerances were determined for laboratory-reared larval and juvenile Gulf of California grunion, Leuresthes sardina. The fish were hatched in the laboratory from artificially fertilized eggs obtained from spawning adults captured with a beach seine. Upper and lower incipient lethal temperatures were determined for prejuveniles acclimated at 22°C and at 30°C. The lowest and highest temperatures to which grunion could acclimate gradually were 8°C and 35°C, respectively, and the overall zone of tolerance (a measure of eurythermality) had an area of 436°C squared, a lower value than has been found for other temperate species. Newly hatched prolarvae were more eurythermal than the older fish. Salinity tolerance also decreased with age, from 4-67.5 °/oo at hatching to 5-57.5 °/oo at 30 days post-hatching. (Authors)

17436. Halliday, M. M. (Ambulatory Clinic, Royal Vet. and Agr. Univ., Copenhagen, Denmark). 1973. STUDIES ON Myxosoma cerebralis, A PARASITE OF SALMONIDS. I. THE DIAGNOSIS OF THE INFECTION. Nordisk Veterin-Med., 25: 345-348; Fish Health News, 3(1): p. 10

The problems of diagnosing whirling disease (Myxosoma cerebralis) are discussed. A pepsin digest method for concentrating the spores is described. -- G. L. Hoffman

17437. Richards, William J. (NMFS, Miami Laboratory, Miami, Florida 33149). 1973. COMMENTS ON THE IDENTIFICATION OF LARVAL SCOMBRID FISHES. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 20-35, illus.

Positive identification of larval Atlantic scombrids is necessary in determining mortality rate and estimating population fluctuations. The characters that facilitate identification of 21 Atlantic species in 11 genera include numbers of myomeres, morphometric, and morphological features, particularly the distribution of chromatophores on the larvae. Larvae are initially separated into three groups according to numbers of myomeres. Genera and species are listed and their distinctive characters described. (Auth.)

17438. Leatherland, John F., B. A. McKeown, and T. M. John (Dept. of Zool., Univ. of Guelph, Guelph, Ontario, Canada). 1974. CIRCADIAN RHYTHM OF PLASMA PROLACTIN, GROWTH HORMONE, GLUCOSE AND FREE FATTY ACID IN JUVENILE KOKANEE SALMON, Oncorhynchus nerka. Comp. Biochem. Physiol., 47(3A): 821-828.

Plasma levels of prolactin and growth hormone in Oncorhynchus nerka show a marked circadian rhythm. High levels of both hormones are found during the dark phase of the photoperiod (03.00 hours to 06.00 hours for prolactin and 24.00 hours to 03.00 hours for growth hormone). Low values for prolactin were found between 12.00 and 16.00 hours and for growth hormone at 15.00 hours. A second "surge" of growth hormone may also be present at 12.00 hours. Plasma FFA levels were high during the morning hours (09.00 hours to 12.00 hours). Plasma glucose levels did not vary significantly at any time period. The possible involvement of prolactin and/or growth hormone in lipid mobilization in O. nerka is discussed. (Authors)

17439. Wigglesworth, Kenneth A., and Robert R. Rawstron. 1974. EXPLOITATION, SURVIVAL, GROWTH, AND COST OF STOCKED SILVER SALMON IN LAKE BERRYESSA, CALIFORNIA. Calif. Fish and Game, 60(1): 36-43.

Reward tagged and untagged silver salmon were stocked in Lake Berryessa, Napa County, California, in 1970 and 1971 to determine harvest, survival, growth rates, and cost. Total harvest was 0.380 and 0.390, with an estimated annual survival of 0.134 and 0.157 for 1970 and 1971, respectively. Silvers achieved a mean weight of 6 lb for the 1970 stocking and nearly 3 lb for 1971. The lower growth rate for 1971 is attributed to depleted stocks of adult threadfin shad during the winter. We postulate that this might have a beneficial effect on the year class strength of young-of-the-year largemouth bass. Cost/lb to the angler's creel of $.44 in 1970 and $.57 in 1971 was comparable to the most economical strain of rainbow trout stocked concurrently in Lake Berryessa. Silver salmon also demonstrated a lower early vulnerability to fishing than most domestic strains of rainbow trout stocked in California. Tags returned by anglers from silver salmon with a mean fork length of 6.8 inches underestimated the true harvest and did not accurately reflect the constribution of untagged fish of the same length to the fishery in 1970.

17440. Peck, James W. (Mich. Dept. of Nat. Res., Marquette Fish. Research Sta., Marquette, Michigan 49855). 1974. MIGRATION, FOOD HABITS, AND PREDATION ON YEARLING COHO SALMON IN A LAKE MICHIGAN TRIBUTARY AND BAY. Trans. Amer. Fish. Soc., 103(1): 10-14.

Migration of newly planted yearling coho salmon (Oncorhynchus kisutch) out of a Lake Michigan tributary and through the connecting bay was monitored with trap nets and pound nets in April-June 1968 and 1969. Concurrently, food habits of coho and their potential piscine predators were examined. Yearling coho migrated out of the Whitefish River within 2 wk and through northern Little Bay de Noc within 4 wk. They fed primarily on insects and crustaceans in both river and bay. Coho were eaten by only 2 of 221 predatory fishes examined. Thus, yearling coho did not prey upon or compete significantly with native game fishes for food, nor were they utilized as food extensively by resident fishes. (Auth.)

17441. Westman, Kai (Bur. of Fish. Investigation, Pitkänsillanranta 1, SF-00 Helsinki 53, Finland). 1973. CULTIVATION OF THE AMERICAN CRAYFISH, Pacifastacus leniusculus. Reprint from: Freshwater Crayfish, pp. 211-220.

17442. Arima, Satoshi, and Shigeru Umemoto. 1973. MERCURY IN AQUATIC ORGANISMS - I. BINDING OF MERCURY TO FISH ACTOMYOSIN. Bull. Tokai Reg. Fish. Res. Lab., Tokyo, Japan, No. 73, pp. 79-84. In Japanese with English figs., tables and abstract.

Mercury compounds were recently found in some fishes. In order to investigate the affinity of mercury to muscle protein which is the major component in fish flesh as foods, some experiments were carried out on the binding properties of mercury compounds to actomyosin prepared from muscles of flatfish, Kareius bicoloratus. When the actomyosin was incubated with mercury dichloride or methylmercury chloride at 0°C for half an hour, a decrease of sulfhydryl group content in the actomyosin was observed. After the incubation a considerable amount of mercury was found in the actomyosin. Little amount of mercury, however, was incorporated into the modified actomyosin with N-ethylmaleimide. The decrease observed in the sulfhydryl group content of the actomyosin by the incubation with mercury compounds is considered to be caused by binding of mercury compounds to the sulfhydryl groups in the actomyosin in the molar ratio of one mercury to two sulfhydryl groups. (Authors)

17443. Graynoth, E., and W. Skrzynski (Fish. Mgmt. Div., Ministry of Agric. and Fish., Wellington, New Zealand). 1973. THE ASHBURTON TROUT AND SALMON FISHERY. N. Z. Min. of Agric. and Fish., Fisheries Tech. Report No. 88, 21 p., illus.

This report describes the trout and salmon fisheries of the Ashburton Acclimatisation District. It is based on angling records collected since 1948 by seven angling diary schemes. Freshwater angling is very popular in this district and has increased in popularity in recent years. The average men's whole season license holder fishes for about 18 days to catch about 10 fish per annum. The total district catch of about 18,000 fish per season includes about 2,000 to 2,500 quinnat salmon. The total angling effort is about 47,000 days. Brown trout are caught in most rivers and rainbow trout in a few lakes. There is a small stock of American brook char in the upper Hinds River and Lake Emily. Quinnat salmon are caught in the three major rivers, with landlocked stocks in one lake. The size of trout varies between the waters but there is no evidence of any historical depreciation in size. The six principal waters and anglers' catches are described. Certain changes could be made to fisheries regulations and the district is in need of more scientific studies on its fisheries in order that they may be correctly managed. (Authors' summ.)

17444. Horsely, R. W. (Dept. of Trade and Industry, Torry Res. Sta., 135 Abbey Road, Torry, Aberdeen, Scotland). 1973. THE BACTERIAL FLORA OF THE ATLANTIC SALMON (Salmo salar L.) IN RELATION TO ITS ENVIRONMENT. J. Appl. Bacteriol., 36(3): 377-386; NOAA, Marine Fish. Abstracts, 27(1): p. 3.

Conservation, aquaculture, and food processing of the Atlantic salmon requires an understanding of the microflora associated with the fish and its environment. Salmon were taken at one coastal location, one estuarine area, and in their migratory route, at two lowland locations and three upland spawning grounds. The microflora of the skin and gills were analyzed, and the water at each location was also analyzed. The principal groups of bacteria on the skin and gills were identified as coryneform organisms; species of Moraxella, Flavobacterium, Cytophaga, Pseudomonas, Acinetobacter, Bacillus; and members of the Micrococcaceae and Enterobacteriaceae. Of the flora found on fish from the coastal waters, Moraxella, Flavobacterium, Cytophaga, coryneform, and Micrococcaceae groups comprised 32, 15, 25, and 14% respectively, of the total flora; the same bacterial groups found on fish taken from the spawning grounds comprised 8, 28, 20, and 10% of the total flora. The count of organisms found on the skin were similar to those found in the water environment of the fish at each sampling location. The bacterial groups in the water were similar to those found on the skin and gills of the salmon.

17445. Hermanutz, Roger O., Leonard H. Mueller, and Kenneth D. Kempfert (U.S. Environ. Protection Agency, Nat'l Water Qual. Lab., Duluth, Minnesota 55804). 1973. CAPTAN TOXICITY TO FATHEAD MINNOWS (Pimephales promelas), BLUEGILLS (Lepomis macrochirus), AND BROOK TROUT (Salvelinus fontinalis). J. Fish. Res. Board Can., 30(12): 1811-1817.

The toxic effects of captan on survival, growth, and reproduction of fathead minnows (Pimephales promelas) and on survival of bluegills (Lepomis macrochirus) and brook trout (Salvelinus fontinalis) were determined in a flow-through system. In a 45-week exposure of fathead minnows, survival and growth were adversely affected at 39.5 μg/liter. Adverse effects on spawning were suspected but not statistically demonstrated at 39.5 and 16.5 μg/liter. The maximum acceptable toxicant concentration (MATC), based on survival and growth, lies between 39.5 and 16.5 μg/liter. The lethal threshold concentration (LTC) derived from acute exposures was 64 μg/liter, resulting in an application factor (MATC/LTC) between 0.26 and 0.62. LTC values for the bluegill and brook trout were 72 and 29 μg/liter, respectively. The estimated MATC is between 44.6 and 18.7 μg/liter for the bluegill and between 18.0 and 7.5 μg/liter for the brook trout. The half-life of captan in Lake Superior water with a pH of 7.6 is about 7 hr at 12C and about 1 hr at 25C. Breakdown products from an initial 550 μg/liter of captan were not lethal to 3-month-old fathead minnows. (Authors)

17446. Gaines, John L., Jr., Forrest J. Ware, and W. A. Rogers. 1973. A SUMMARY OF FINDINGS ON THE NEMATODE, Goezia sp. IN THE SOUTHEASTERN UNITED STATES. Proc. of 26th Ann. Conf. Southeastern Assn. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 334-335.

17447. Tiews, K., H. Koops, J. Gropp, and J. Tiews (Inst. for Coastal- and Freshwater Fishery of the Fed. Res. Inst. for Fishery, Hamburg, Germany). 1973. ON THE BODY COMPOSITION OF NET-CAGE-HELD TROUT (Salmo gairdneri) IN RELATION TO FEED AND GROWTH. Arch. Fischereiwiss., 24 (1-3): 261-269. In German with English summary.

In two trials with rainbow trout in net cages the influence of dietary factors (protein level and source, energy density) and of the growth rate on certain criteria of the body composition has been tested. With increasing body weight and growth rate the fat level of the muscle mass dry matter was elevated, the crude protein level was reduced. This interaction concerning the body composition of homoiothermous animals is well known. The ash content of the defatted muscle mass tissue was not influenced by the growth rate or by changes of the diet composition. The fatty acid pattern of the dietary fat had a definite effect on the fatty acid distribution of the body fat. Additional special effects were obtained when severe growth depression occurred due to dietary energy deficit. The amino acid pattern of trout protein is characterized by a high concentration of essential amino acids similar to the protein of most fish species. Dietary energy concentration has no influence on the amino acid distribution in trout protein. (Authors' summ.)

17448. Klontz, George W. 1973. A SURVEY OF FISH HEALTH MANAGEMENT IN IDAHO. Coll. Forestry, Wildl. and Range Sci., Univ. of Idaho Information Series No. 3, 34 p.; Fish Health News, 3(1): p. 12, 1974.

The State of Idaho is known as the "leading producer of hatchery-raised game and commercial salmonids"; catfish are also raised. It is estimated that in 1971-1972 between 12 to 14 million pounds of fish were raised. For this reason the State of Idaho presents an excellent opportunity for the study of diseases and their effects on trout production. In a series of tables quantitative data are presented showing losses caused by 12 of the most important communicable, and 6 or 7 environmental diseases. The percent of mortalities in all fish-raising facilities in 1972 were 12.4% of eggs; 16.4% of 2.5 to 7.5 cm fish; 10.0% of 7.5 to 15.5 cm fish and 2.7% of 15.5 - 30.0 cm fish. The estimated value of losses caused by diseases in commercial hatcheries is estimated at a half-million dollars. It is hoped that these losses can be cut in half by improved disease control. -- S. F. Snieszko

17449. Sherburne, Stuart W. (Northeast Fish. Center, NMFS, NOAA, West Boothbay Harbor, Maine 04575). 1973. DIFFERENTIAL BLOOD CELL COUNTS OF ATLANTIC HERRING, Clupea harengus harengus. NOAA Fish. Bull., 71(4): 1011-1017.

In differential blood counts of 200 herring, Clupea harengus harengus, the percentages of white cell types and immature erythrocytes in the blood were found to be different from those previously reported in the literature. Herring were sampled from February 1969 through July 1969 from the Boothbay Harbor, Maine, and Deer Island, New Brunswick, Canada, areas. Immature erythrocytes in wild herring ranged from 6 to 38% with an average of 21; in captive herring they ranged from 2 to 22% with an average of 11. Thrombocytes were the most common type of leukocyte, followed in decreasing order by lymphocytes, neutrophils, basophils, and eosinophils in both captive and wild herring. The percentage of each white cell type varied greatly between individual herring, but except in one instance, the mean percentage of each white cell type varied little between samples. One group of wild herring was unusual in that neutrophils averaged 21% of the leukocytes in contrast with an average of 4% neutrophils for three other wild samples and an average of 6.8% neutrophils for four captive samples. The percentage of immature red cells varied widely between individual herring, but the mean percentage varied little between wild and captive herring within their respective categories. (Auth.)

17450. Mackiewicz, John S. (Biol. Sci., State Univ. of New York at Albany, Albany, New York). 1974. Calentinella etnieri gen. et sp. n. (CESTOIDEA: CARYOPHYLLAEIDAE) FROM Erimyzon oblongus (Mitchill) (CYPRINIFORMES: CATOSTOMIDAE) IN NORTH AMERICA. Proc. Helminthol. Soc. Wash., 41(1): 42-45.

The new genus and species is described from the creek chubsucker, Erimyzon oblongus (Mitchill), in western Tennessee. Calentinella differs from other single-gonopored genera by having an ovary without posterior arms, lacking an external seminal vesicle, and having a weakly developed cuneiform scolex. A key to the single-gonopored genera in the family Caryophyllaeidae is presented. (Auth.)

17451. Triplett, E., and J. R. Calaprice (Dept. of the Environ., Fish. and Marine Serv., Pacific Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1974. CHANGES IN PLASMA CONSTITUENTS DURING SPAWNING MIGRATION OF PACIFIC SALMONS. J. Fish. Res. Board Can., 31(1): 11-14.

Blood constituents were measured in salmon (Oncorhynchus gorbuscha and O. nerka) at various times during the spawning migration. Values for blood sodium, potassium, calcium, glucose, protein, and hematocrit suggested that during early stages of migration through postspawning these fish experience a syndrome reminiscent of mammalian hypoadrenocorticism. The reverse was true of fish in advanced stages of senescence. Older fish also suffered ascorbate deficiency with a resultant necrosis of the skin. This deficiency was corrected by intraperitoneal injection of ascorbate. Various forms of hormone therapy applied to senescent fish were unsuccessful in prolonging their life appreciably. (Authors)

17452. Bournaud, M., and M. Thibault (Biol. animale et Zool., Univ. Lyon-I, 43, bd du 11-Novembre, 69621 Villeurbanne, France). 1973. THE DRIFT OF ORGANISMS IN FLOWING WATER. (La Derive des Organismes dans les eaux Courantes). Ann. Hydrobiol., 4(1): 11-49. In French with English summ.

The present work analyses and summarizes information obtained from about 10 years work on drift (the aggregate of organisms and debris carried downstream by the current). (From Authors' summ.)

17453. Halliday, M. M. (Ambulatory Clinic, Royal Vet. and Agr. Univ., Copenhagen, Denmark). 1973. STUDIES ON Myxosoma cerebralis, A PARASITE OF SALMONIDS. II. THE DEVELOPMENT AND PATHOLOGY OF Myxosoma cerebralis IN EXPERIMENTALLY INFECTED RAINBOW TROUT (Salmo gairdneri) FRY REARED AT DIFFERENT WATER TEMPERATURES. Nordisk Veterin-Med., 25: 349-358, (Ibid); Fish Health News, 3(1): p. 10, 1974.

Trophozoites, spores and pathological changes in sections are described and illustrated. Development of the spores at 17C took only 52 days compared to 101 days at 12C and 120 days at 7C. Clinical signs also appeared earlier at warmer temperatures. -- G. L. Hoffman

17454. Johnson, B. T., and J. O. Kennedy (Bur. Sport Fish. & Wildl., Fish-Pesticide Res. Lab., Columbia, Missouri). 1973. BIOMAGNIFICATION OF P,P'-DDT AND METHOXYCHLOR BY BACTERIA. Applied Microbiology, 26(1): 66-71; Selected Water Resources Abstracts, 7(2): p. 46, 1974.

Strains of Aerobacter aerogenes and Bacillus subtilis were exposed to 1 ppm C-14-labeled DDT or methoxychlor in distilled water to determine uptake kinetics and retention of the pesticides. The bacteria accumulated p,p'-DDT and methoxychlor directly from water. Uptake of both C-14-labeled organochlorine insecticides was rapid; 80 to 90 percent of the 24-h residues were reached with 30 min. Total cellular residues varied linearly with concentrations of DDT and methoxychlor in water ranging from 0.5 to 5.0 micrograms/liter. The residue magnification factors from water were between 1,400- to 4,300-fold, but were independent of insecticide concentrations in water. When the insecticide-exposed microbial cells were washed with pesticide-free water, DDT residues were 45 percent in A. aerogenes and 30 percent in B. subtilis, whereas the methoxychlor level decreased nearly 75 percent in both organisms. Subsequent washing did not further reduce the insecticide residue. Autoclave-killed bacteria also rapidly adsorbed DDT and methoxychlor from water and, in some instances, residues were higher than in the living cells. Molecular polarity and lipid solubility appear to influence the retention of the organochlorine insecticides by bacterial cells.

17455. Ishii, Kiyoshi (Lab. of Freshwater Fish Culture, Fac. of Fish., Hokkaido Univ., Hakodate, Japan). 1971. MORPHOLOGICAL CHANGES IN THE LIVER OF THE KOKANEE, Oncorhynchus nerka, ACCOMPANIED WITH SEXUAL MATURATION. Bull. Fac. Fish. Hokkaido Univ., 22(3): 215-220 and plates. In Japanese with English abstract and figures.

The liver of the kokanee, Oncorhynchus nerka, was investigated by a light and electron microscope. The fish used in the present study was sampled from the outdoor pond of the Chitose Branch of Hokkaido Salmon Hatchery from June 1968 to October 1969. In the one-year-old fish, hepatosomatic indices (HSI) ranged from 1.0 to 1.2 percent. On the contrary, HSI in the two-year-old maturing fish tended to increase along with the gonadal maturation and the female fish had larger HSI than those of the males. In these female fish, the liver cells became larger in size and they had a round nucleus and the cytoplasm stained strongly with dye. Ultrastructurally the cytoplasm of the liver cell is filled with a lot of vesicular endoplasmic reticulum. After spawning the liver cell of the fish showed some degenerative changes; the nucleus darkened and many eosinophilic granules appeared in the cytoplasm. From the findings it was suggested that in the kokanee the changes of the liver cell might be caused not only by gonadal maturation but also by starvation or some inner factors of the fish. (Auth.)

17456. Tuunainen, Pekka (Riista- ja kalatalouden tutkimuslaitos, kalantutkimusosasto, Pitkansillanranta 1 A, 00530 Helsinki 53, Finland). 1972. ON THE HYDROLOGICAL, PHYSICAL AND CHEMICAL CONDITIONS OF LAKE KONNEVESI, CENTRAL FINLAND. Suomen Kalatalous 46: 3-10. In Finnish with Eng. abstract.

This survey is part of a larger limnological research program designed to elucidate the fishery of Lake Konnevesi, Central Finland. The northern and southern parts of the lake basin are somewhat dissimilar. In the northern part, the bottom is fairly level, there are few islands and the volume of the hypolimnion is very small. In the southern part, there are many deeper places, islands are numerous and the volume of the hypolimnion is many times as great as in the northern part. The properties of the water indicate that Lake Konnevesi is an oligotrophic and oligohumous lake. Only slight differences in the physical and chemical parameters were found between the northern and southern parts of the lake. (Auth.)

17457. Davies, William D. (Bur. of Sport Fish. & Wildl., Coop. Fish. Unit, N. C. State Univ., Raleigh, North Carolina 27607). 1973. THE EFFECTS OF TOTAL DISSOLVED SOLIDS, TEMPERATURE, AND pH ON THE SURVIVAL OF IMMATURE STRIPED BASS: A RESPONSE SURFACE EXPERIMENT. Prog. Fish-Cult., 35(3): 157-160.

17458. Eddy, F. B. (Res. Unit for Comp. An. Resp., Univ. of Bristol, Bristol, England). 1974. BLOOD GASES OF THE TENCH (Tinca tinca) IN WELL AERATED AND OXYGEN-DEFICIENT WATERS. J. Exp. Biol., 60(1): 71-83.

The respiration of tench at 13°C was investigated, particular attention being given to the role of the blood in uptake and transport of oxygen. In well aerated water the mean value for arterial blood was 36 mm Hg, for P_{CO_2} 3.3 mm Hg and for pH 8.16, the respective venous values were 7 mm Hg, 5 mm Hg and 8.08. Arterial blood averaged about 75% and venous blood about 40% oxygen saturation. The mean value for oxygen uptake was 0.5 ml/min/kg and for ventilation volume 132/ml/min/kg. The oxygen tension and the percentage saturation of the blood determined in vivo are discussed in terms of the oxygen dissociation curve determined in vitro. When the environmental P_{O_2} was decreased, tench responded by increasing breathing rate and ventilation volume. Arterial P_{O_2} and P_{CO_2} decreased but arterial pH tended to remain steady. There was also a significant increase in blood lactate. That tench can withstand severe hypoxic conditions is attributed to blood of high oxygen affinity and the ability to maintain a favorable acid-base status in the blood for oxygen transport. Respiration in tench is compared with that in other fish species. (Auth. summ.)

17459. Barton, J. R., and P. V. Winger (Dept. Civil Engineering, Brigham Young Univ., Provo, Utah 84602). 1973. REHABILITATION OF A CHANNELIZED RIVER IN UTAH. HYDRAULIC ENGINEERING AND THE ENVIRONMENT. Proc. of the Hydraulic Specialty Conf., Bozeman, Montana, Aug. 15-17, p. 1-10.

Construction of Interstate 80 in Henefer Valley, Utah resulted in channelization of 1.6 miles of Weber River. In an attempt to alleviate some of the adverse effects of channelization, instream rehabilitation structures in the form of deflectors and check dams were installed in the altered sections. Because of these structures, hydrologic features in the changed portions of the river were similar to those of the unchanged areas. Holes were scoured around the structures and material was deposited below, forming riffle areas. There were as many holes and riffles in the changed sections as in the unchanged. Channelized portions of the Weber River were rapidly populated by macroinvertebrates. After six months with substantial stream flows and stabilization of the substrate, no difference in numbers, weight, or species diversity could be detected between the benthos of the changed and the unchanged sections. Fish population estimates were difficult to obtain due to the size of the river, high mobility of the fish, and low shocking efficiency especially at high discharges. However, shocking data did indicate that fish populations were essentially the same in the changed and unchanged areas as a result of the rehabilitation measures taken. DeLury population estimates collected in 1972 indicate that the fish populations were similar in changed and unchanged areas and that shocking efficiency decreases as a number of holes and amount of cover increase. Fish populations were composed mainly of whitefish (80%) with cutthroat, rainbow, brown, suckers, and carp, making up the rest of the population. Rehabilitation structures did provide holes and riffles in the changed sections, nevertheless, channelization should be avoided if at all possible since other deleterious effects still occur such as loss in stream length, loss of cover, loss in streamside vegetation and loss in aesthetic value. (Authors)

17460. Kulakovskaya, O. P., and V. M. Ivasik (Museum of Nat. Hist., Ukrainian Acad. of Sci., USSR). 1973. LONG-TERM CHANGES IN THE PARASITIC FAUNA OF SOME FISHES IN THE DNIESTER BASIN. Hydrobiological Journal, 9(1): 34-38.

The species composition, degree and intensity of infestation, and density of parasites of seven fish species in the Upper Dniester basin experienced considerable changes from 1952 to 1968. The number of species declined from 61 to 41, mainly because of the disappearance of those parasites that in their free-swimming development stages are unprotected against unfavorable environmental factors. (Authors)

17461. Kudrinskaya, O. I. (Inst. of Hydrobiol., Ukrainian Acad. of Sci., Kiev, USSR). 1973. WEIGHT LENGTH RATIO IN CERTAIN FISH LARVAE. Hydrobiol. Journal, 9(1): 52-54.

17462. Galasun, P., and A. Kanid'ev (UkrNIIRKh, USSR). 1973. THE BUFFALO AND AMERICAN CATFISH - NEW OBJECTS OF POND CULTURE (Buffalo i Amerikanskiĭ Som - Novye Ob''ekty Prudovogo Rybovodstva). Rybnoe Khozyaĭstvo, No. 11, pp. 13-15. In Russian.

Experimental work is being conducted in the USSR on culture of the buffalo and catfish. There is reason to suppose that the catfish can be a promising object of culture in the cooling waters of hydroelectric stations, where there are favorable temperature conditions for it, as well as at pond farms of the southern belt of the RSFSR, the Ukraine and Middle Asia.

17463. Rafail, S. Z. (Inst. of Oceanogr. and Fish., Kayed Bey, Alexandria, Egypt). 1972. THE APPLICATION OF A MULTIPLE-RECAPTURE TECHNIQUE FOR THE STUDY OF RELATIVELY SMALL FISH POPULATIONS. Marine Biology, 16(3): 253-260.

Expressions are given for the estimation of catchability of untagged fish using the type of multiple-recapture experiments suited to relatively small fish populations. In these experiments all captured fish are released after tagging untagged fish. The realistic assumption that fish populations suffer from different causes of mortality during the sampling surveys is adopted here. The catchability estimate for untagged fish is used to evaluate instantaneous fishing mortality, abundance, survival, instantaneous total mortality and instantaneous natural mortality rates of untagged fish. These estimates are free from Types A and B tagging errors, and take into consideration that catchabilities of tagged and untagged fish are different. (Auth.)

17464. Wiggins, Glenn B. 1973. NEW SYSTEMATIC DATA FOR THE NORTH AMERICAN CADDISFLY GENERA Lepania, Goeracea AND Goerita (TRICHOPTERA: LIMNEPHILIDAE). Life Sci. Contr., R. Ont. Mus. No. 91, 33 p.

In a brief synopsis of the North American genera Lepania, Goeracea, and Goerita, larvae and pupae are described for the first time for Lepania cascada Ross, Goeracea genota (Ross), Goeracea oregona Denning, and Goerita betteni Ross. Keys to larvae, males, and females are given for the two species now known in each of the genera Goeracea and Goerita. For Lepania cascada an analysis is made of systematic characters of larvae, pupae and adults, demonstrating the probability that true affinities of the species lie with the limnephilid subfamily Goerinae rather than with the Apataniinae, to which it has been most recently assigned. A new tribe, Lepaniini, is created in the Goerinae for the genus. Based on retention of several primitive characters, Lepania is regarded as a genus of unusual phylogenetic significance, annectent between the ancestral stock of the Limnephilidae (auct., excluding Goeridae) and the Goerinae, treated in this paper as a subfamily of the Limnephilidae. (Auth.)

17465. Wahle, Roy J., Robert R. Vreeland, and Robert H. Lander (Columbia River Fish. Prog. Office, NMFS, NOAA, 811 Northeast Oregon St., Portland, Oregon 97208). 1974. BIOECONOMIC CONTRIBUTION OF COLUMBIA RIVER HATCHERY COHO SALMON, 1965 AND 1966 BROODS, TO THE PACIFIC SALMON FISHERIES. NOAA Fish. Bull., 72(1): 139-169.

Marked coho salmon, Oncorhynchus kisutch, smolts of the 1965 and 1966 broods were released from 20 hatcheries on four sections of the Columbia River and tributaries. Commercial and sport fisheries in marine waters from Pelican, Alaska, to Avila Beach, Calif., and on the Columbia River were sampled during 1967-69 for marks. The net value of the estimated total catch of hatchery fish was calculated after adjusting for the effects of marking. Also estimated for each brood were the total costs of rearing including amortized capital outlay. Total benefits of $8.58 million for the 1965 brood and $9.11 million for the 1966 brood were estimated as applicable to normal production years when no marking takes place. Corresponding costs were estimated as $1.29 million for the 1965 brood and $1.23 million for the 1966 brood. Estimated benefit/cost ratios for the 20 Columbia River coho salmon hatcheries, as operated under production regimes prevailing during the study, may prove useful in decisions affecting management policies. The ratios are 6.6/1 for the 1965 brood, 7.4/1 for the 1966 brood, and 7.0/1 for both broods combined. (Authors)

17466. Soivio, Antti, Kai Westman, and Keijo Nyholm (Div. of Physiol. Zool., Dept. of Zool., Univ. of Helsinki, Arkadiankatu 7, 00100 Helsinki 10, Finland). 1972. IMPROVED METHOD OF DORSAL AORTA CATHETERIZATION: HAEMATOLOGICAL EFFECTS FOLLOWED FOR THREE WEEKS IN RAINBOW TROUT (Salmo gairdneri). Finnish Fish. Res. No. 1, pp. 11-21. In English.

An improvement in the technique for dorsal aorta catheterization is described, in which a sharpened steel wire inside an untipped vascular catheter is used when introducing the catheter into the vessel. Haematocrit and haemoglobin were followed for three weeks after catheterization in rainbow trout (Salmo gairdneri Richardson) in order to examine the effects of handling, anaesthetization with MS-222, the catheterization procedure and different heparin concentrations used for flushing and filling the cannulas. All samples were obtained from the catheters of the same marked specimens. Anaesthetization, or probably the hypoxic conditions developing in fish during anaesthetization, induced marked alterations in haematocrit and slightly less marked in haemoglobin concentrations, and a recovery period of about three days is needed before the animals can be used for experimental purposes. Recovery was significantly better when less concentrated heparin was used for flushing and filling the catheters, most probably owing to decreased blood loss at the site of penetration of the dorsal aorta. The greatest difficulty encountered was the loosening of the cannulas at the end of the experiment, caused by the erosion of the sutures through the roof of the mouth. A description is given of a simple modification in the cannulation procedure designed to solve this problem. (Authors)

17467. Graynoth, E. (Fish. Mgmt. Div., Min. of Agric. and Fish., Wellington, New Zealand). 1973. THE HAWKE'S BAY TROUT FISHERY. N. Z. Min. of Agric. and Fish., Fish. Tech. Report No. 114, 45 p.

This report describes the trout fisheries of Hawke's Bay Acclimatisation District. It is based on angling results collected since 1947 by eight angling diary schemes. Angling license sales have increased in recent years and it was estimated that the average Men's Whole Season License holder fished for fourteen days to catch seven trout per season. The total district catch of 13,000 trout was caught in 34,000 days angling. Rainbow trout are the principal species caught and the average length of angler caught fish has changed little over the past twenty years. Brown trout are caught in some waters. Rainbow trout densities and stocks in the rivers were estimated by drift diving and it is suspected that anglers catch a large proportion of the stock. The major fisheries are described and management advice is given. (Auth.'s summ.)

17468. Thayer, Gordon W., Donald E. Hoss, Martin A. Kjelson, William F. Hettler, Jr., and Michael W. LaCroix (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina). 1974. BIOMASS OF ZOOPLANKTON IN THE NEWPORT RIVER ESTUARY AND THE INFLUENCE OF POSTLARVAL FISHES. Chesapeake Science, 15(1): 9-16.

Numerical abundance, biomass, and caloric content of zooplankton were estimated from biweekly samples collected during 1970-1972 from the lower estuary of the Newport River, North Carolina. All three measurements generally were maximum during early fall and again in late winter or early spring. During November larval fishes, primarily pinfish (Lagodon rhomboides), spot (Leiostomus xanthurus), and menhaden (Brevoortia tyrannus), began entering the estuary. The larvae reached maximum abundance in the estuary during March and April. Zooplankton abundance declined significantly at this time during 1970 and somewhat later during 1971. We hypothesize that zooplankton abundance may control the survival of fishes during their transition from larvae to juveniles and that the larvae have a significant effect in reducing the standing crop of zooplankton. Analysis of the gut contents of these fishes indicated they feed predominantly on zooplankton. Routine metabolism of the larvae would require that the standing crop of larvae graze an average 10 percent of the 1970 standing crop of zooplankton daily during January-May. (Authors)

17469. Webb, P. W. (Fish. Res. Board of Can., Pacific Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1973. EFFECTS OF PARTIAL CAUDAL-FIN AMPUTATION ON THE KINEMATICS AND METABOLIC RATE OF UNDERYEARLING SOCKEYE SALMON (Oncorhynchus nerka) AT STEADY SWIMMING SPEEDS. J. Exp. Biol., 59(3): 565-581.

Propulsive wavelength, tail-beat frequency, trailing-edge amplitude, critical swimming speed and oxygen consumption rates have been measured for sockeye salmon in which the trailing edge depth and caudal-fin area were variously reduced by partial caudal-fin amputation. The swimming form was sub-carangiform. The 45 min. critical swimming speed was not significantly reduced by removal of either the epaxial or hypaxial caudal-fin lobes, but was reduced significantly ($P < 0.05$) to 51.8 cm/sec (2.5 l/sec) when both lobes were removed. The mean length of the propulsive wave was 1.00 body length, and was not affected by the caudal-fin surgery. Both tail-beat frequency and amplitude increased with speed, their product linearly so. Normalization of data in relation to the physiological maximum at the critical swimming speed showed no relative changes in frequency and amplitude. No significant differences were observed in standard or active metabolic rates. General equations describing thrust and drag were compared. It was shown that the drag on the caudal fin was markedly increased by lateral propulsive movements as suggested by Bone's boundary-layer thinning hypothesis. Drag coefficients for the caudal fin were one to two orders of magnitude higher than would be expected in the absence of lateral movements. It is considered that the principal function of the caudal fin is in manoeuvre and acceleration. (Auth.'s summ.)

17470. Freeman, T. E., R. Charudattan, and F. W. Zettler (Dept. of Plant Pathology, Fla. Univ., Gainesville, Florida). 1973. BIOLOGICAL CONTROL OF WATER WEEDS WITH PLANT PATHOGENS. Fla. Water Resources Research Center Publication No. 23, 52 p., 4 fig, 9 pl, 3 tab, 29 ref., available NTIS as PB-225 473/8 $3.50 paper copy, $1.45 microfiche; Selected Water Resources Abstracts, 7(4): p. 52.

A search was made for diseases of water weeds to use as biocontrol. Emphasis was placed on finding diseases of waterhyacinth (Eichhornia crassipes), alligatorweed (Alternathera philoxeroides), hydrilla (Hydrilla verticillata), and Eurasian watermilfoil (Myriophyllum spicatum). Surveys included all of Florida and parts of Alabama, Maryland, Louisiana, Georgia, South Carolina, the Chesapeake Bay and the Tennessee Valley areas. Also Puerto Rico, Guatemala, El Salvador, Panama, Colombia, Mexico, Barbados, Jamaica, Trinidad, and in the states of Mysore, Kerala, Tamilnadu, Kashmir, Uttar Pradesh, Rajasthan, Orissa and West Bengal in India. Foremost discoveries were: (1) A blight of waterhyacinth incited by Rhizoctonia solani in India, Panama, and Puerto Rico, (2) A zonate leaf spot of waterhyacinth incited by Cephalosporium zonatum, found in Florida and Louisiana and also in El Salvador, Puerto Rico and India, (3) A virus-induced stunting disease of alligatorweed from Florida, (4) A Pythium and Sclerotium incited blight of hydrilla and a Penicillium sp. that produces metabolites lysogenic to hydrilla, first ever recorded on hydrilla and (5) A root and crown disease of waterhyacinth of unknown cause in Florida.

17471. Kabata, Z. (Dept. of the Environ. Fish. & Mar. Serv., Pacific Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1974. Lepeophtheirus cuneifer sp. nov. (COPEPODA: CALIGIDAE), A PARASITE OF FISHES FROM THE PACIFIC COAST OF NORTH AMERICA. J. Fish. Res. Board Can., 31(1): 43-47.

Lepeophtheirus cuneifer sp. nov. (Copepoda: Caligidae) is described and illustrated. This copepod is a parasite of marine fishes off the coast of Alaska, its hosts including Raja binoculata and Hexagrammos lagocephalus. Other possible hosts are Leptocottus armatus and Theragra chalcogramma. (Auth.)

17472. FAO Fishery Resources Division (Rome, Italy). 1973. FAO SPECIES IDENTIFICATION SHEETS FOR FISHERY PURPOSES. MEDITERRANEAN AND BLACK SEA (FISHING AREA 37). FAO of the United Nations, Volumes I and II.

17473. Hoffman, Glenn L., and Fred P. Meyer (Bur. Sport Fish. & Wildl., Eastern Fish Disease Lab., Kearneysville, West Virginia 25430). 1974. PARASITES OF FRESHWATER FISHES: A REVIEW OF THEIR CONTROL AND TREATMENT. T.F.H. Publications, Inc., 211 West Sylvania Ave., P. O. Box 27, Neptune City, New Jersey 07753, 224 pp, $12.95.

This is the first review of the subject since 1928. Included are chapters on methods, conversion information, synopsis of the most widely used treatments, glossary, tables of methods reported with references, toxicity of parasiticides, and chemical synonyms. There are 390 references. Most unusual in parasitology is the inclusion of 105 color photographs of fish parasites. This book is intended for fish disease researchers and students, fish pathobiologists, fish culturists, and aquarists. (Authors)

17474. Forney, John L. (Dept. of Nat. Res., Cornel Univ., Ithaca, New York 14850). 1974. INTERACTIONS BETWEEN YELLOW PERCH ABUNDANCE, WALLEYE PREDATION, AND SURVIVAL OF ALTERNATE PREY IN ONEIDA LAKE, NEW YORK. Trans. Amer. Fish. Soc., 103(1): 15-24.

Species of forage fish in stomachs of walleye and their abundance in trawl catches were compared in 1968-71. Young yellow perch were the predominant species in trawls and were consistently selected by walleyes. Consumption of young white perch and walleyes by older walleyes increased during periods of low yellow perch abundance which suggested that young yellow perch might act as a buffer controlling intensity of predation. This possibility was assessed by comparison of relative survival of white perch and walleye cohorts between the first and second year of life with indices of yellow perch density between 1959 and 1970. Close correlations between these variables support the conclusion that abundance of young perch governs intensity of predation on other forage size fish and indirectly controls the size of the walleye population by regulating cannibalism. (Auth.)

17475. Minchew, C. Douglas (Wildl. and Fish. Dept., Mississippi State Univ., Mississippi State, Miss.). 1973. IDENTIFICATION AND FREQUENCY OF OCCURRENCE OF FOUR FORMS OF Henneguya FOUND IN CHANNEL CATFISH. Proc. 26th Ann. Conf. SE Assn. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 336-340.

The terms intracapillary, interlamellar, cutaneous and visceral are proposed as names for four working forms or categories of Henneguya spp. found in channel catfish. Guidelines for their proper identification are suggested and the severity and incidence of each form are documented. (Auth.)

17476. Bothwell, Max L., A. M. Beeton, and John J. Lech (Center of Great Lakes Studies, Univ. of Wisconsin-Milwaukee, Milwaukee, Wis. 53201). 1973. DEGRADATION OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL BY BOTTOM SEDIMENTS. J. Fish. Res. Board Can., 30(12): 1841-1846.

At low oxygen tensions in sediment-water aquaria systems, concentrations of 3-trifluoromethyl-4-nitrophenol (TFM) in the range 5-10 mg/liter were reduced to 3-trifluoromethyl-4-aminophenol (RTFM) in 5-20 days. This reduction resulted in loss of the characteristic yellow color of TFM as measured by the optical density at 395 nm. The reduced form was apparently stable, although inconclusive evidence suggested that some additional breakdown of RTFM may have occurred within 3 months under anoxic conditions. Under aerobic conditions, no significant degradation of TFM was observed for periods of up to 2.5 months. Sorption of TFM by sediments was observed to some extent and appeared to vary with the sediment source. (Authors)

17477. Kossman, Heinrich (Inst. for Coastal & Freshwater Fishery of the Fed. Res. Inst. for Fishery, Ahrensburg Outpost, Germany). 1973. STUDY OF THE PRESERVATION OF CARP SPERM (Cyprinus carpio). Arch. Fischereiwiss., 24(1-3): 125-128. In German with English summ.

Various admixtures were tested concerning their effects on carp sperm stored in the refrigerator and at -196°C. The motility of the sperm lasted for several days in the refrigerator and with certain admixtures also after the sperm had been deep-frozen at -196°C. Cryo-preserved sperm had lost its fertility after thawed. (Auth. summ.)

17478. Valtonen, Tapani (Dept. of Zool. and Bothnian Bay Biol. Sta., Univ. of Oulu, Oulu, Finland). 1974. SEASONAL AND SEX-BOUND VARIATION IN THE CARBOHYDRATE METABOLISM OF THE LIVER OF THE WHITEFISH. Comp. Biochem. Physiol., 47(2A): 713-727.

Seasonal variations in the weight of the liver, its glycogen content and two carbohydrate enzyme activity values were studied in specimens of Coregonus nasus (Pallas), sensu Svärdson. The results obtained for virgin fish and for maturing or spent males revealed similar patterns of variation, though the figures for the virgin fish were generally somewhat higher. The group of males in spawn, measured in October, stood out by virtue of the high liver glycogen content recorded. Compared with the other groups, the mature or spent females had larger livers from July (the onset of rapid gonadal development) to January, lower liver glycogen content during the winter, lower G6Pase activity during September-November and lower glycogen phosphorylase activity from August until the spring. The main reasons for these sexual differences are thought to be the vitellogenetic role of the liver and an estrogen-induced inhibition in the carbohydrate metabolism. The high glycogen content observed in November and the winter months, the increased liver size found in virgin fish and the increase in G6Pase activity in midwinter are all associated with seasonal acclimatization. The increase in glycogen phosphorylase activity in virgin fish and in males took place during the autumn. On one occasion very low G6Pase activities were found, together with rapidly increasing glycogen content in the liver. In general, the liver glycogen content decreased considerably in the spring while the sea was still frozen over, though this decrease was completed between taking the May and June samples. The phenomenon was accompanied by high glycogen phosphorylase activity, especially in the virgin fish. (Auth.)

17479. Kalber, Frederick A. (Aquatic Sciences, Inc., Boca Raton, Florida 33432). 1973. TECHNIQUES FOR MEASURING OSMOTIC AND IONIC CONCENTRATIONS IN FISH EGGS AND LARVAE. Proc. of Workshop on Egg, Larval and Juvenile Stages of fish in Atlantic Coast Estuaries, NOAA Tech. Publn. No. 1, p. 36.

Techniques for measuring ionic and osmotic concentrations in small samples of biological fluids taken from fish eggs and larvae were reviewed. The Kalber biological cryoscope is the only available way for measuring osmoconcentrations in nanoliter volumes of fluid taken from these small systems. Sodium, potassium, calcium, and magnesium ion determinations are possible through helium glow plasma flow absorption spectrophotometry. A device is available to determine such elements in nanomolar concentrations and nanoliter volumes. Procedures for withdrawal of fluid from fish eggs and larvae were also discussed. (Auth.)

17480. Markiw, M. E., and Ken Wolf (Bur. of Sport Fish. & Wildl., Eastern Fish Disease Lab., Kearneysville, West Virginia 25430). 1974. Myxosoma cerebralis: ISOLATION AND CONCENTRATION FROM FISH SKELETAL ELEMENTS - SEQUENTIAL ENZYMATIC DIGESTIONS AND PURIFICATION BY DIFFERENTIAL CENTRIFUGATION. J. Fish. Res. Board Can., 31(1): 15-20.

An effective sequential procedure for recovery of Myxosoma cerebralis spores from infected trout was developed, and quantification of spores was carried out at each step of release and concentration. Methods are described for fresh and frozen material. Effective concentration of from 1100- to 9000-fold and an estimated efficiency of recovery of about 80% has been achieved. Tabular and graphic data are presented with recommendations for diagnostic applications. The immediate applications of these procedures are in implementing more effective detection and in preparing antigen for the immunologic studies that should provide the most sensitive detection. (Authors)

17481. Carter, Neal M. 1973. INDEX AND LIST OF TITLES. FISHERIES RESEARCH BOARD OF CANADA AND ASSOCIATED PUBLICATIONS 1965-1972. Fish. Res. Board Can. Miscellaneous Special Publication 18, 588 p., price $3.00.

17482. U.S. Dept. of Commerce. 1973. REPORT OF THE NATIONAL MARINE FISHERIES SERVICE FOR THE CALENDAR YEAR 1972. U.S. Dept. of Commerce, NOAA, NMFS, Seattle, Washington, 68 p.

17483. Wildish, D. J. 1972. ACUTE TOXICITY OF POLYOXYETHYLENE ESTERS AND POLYOXYETHYLENE ETHERS TO S. salar AND G. oceanicus. J. Water Res. No. 6, 759-762; Water Pollution Abstracts, 46(1): 30, 1973; NOAA Marine Fisheries Abstracts, 27(1): p. 34, 1974.

The toxicity of nonionic surface-active agents, of the type used in oil-dispersing formulations, was investigated using salmon parr in fresh water and Gammarus oceanicus, a crustacean in seawater. The polyoxyethylene ethers were much more toxic than the polyoxyethylene esters to both organisms. The lower toxicity of the esthers was attributed to the relative ease of cleavage of the ester linkage by lipid metabolizing enzymes.

17484. Alley, W. P., H. R. Brown, and L. Y. Kawasaki. 1974. LEAD CONCENTRATIONS IN THE WOOLY SCULPIN, Clinocottus analis, COLLECTED FROM TIDEPOOLS OF CALIFORNIA. Calif. Fish and Game, 60(1): 50-51.

Muscle tissues of wooly sculpin, Clinocottus analis, were examined for lead. Concentrations varied at average values from 0.6 ppm to 4.9 ppm depending on the area sampled. The fish collected close to large population centers had the most lead. It is postulated that this species would be suitable for monitoring lead in the environment. (Authors)

17485. Musick, J., and M. L. Wiley (Va. Inst. of Marine Sci., Gloucester Point, Virginia). 1973. FISHES OF THE CHESAPEAKE BAY. In: Army Corps of Engineers Chesapeake Bay Existing Conditions Report, App. C, Vol. 2, p. C 141-C 142; Selected Water Resources Abstracts, 7(2): p. 22, 1974.

The fishes are a very conspicuous and important component of the fauna of Chesapeake Bay. The taxonomic status of the group is probably understood as well for the Bay as any other comparable geographic area but much work remains to be done at the subspecific and racial levels. Least known is the seasonal occurrence of large adult marine species, particularly sharks. Commercial fisheries catch statistics provide crude estimates of the relative abundance of commercially important species from year to year. Some species of fish inhabits nearly every available habitat within the Bay, and collectively they consume at all zooplankton (anchovies, silversides) and bottom invertebrates (hogchoker, white perch). Some are generalized predators (striped bass) while others live mainly on molluscs (drums, cownosed rays), fishes (bluefish), or crustaceans (oyster toadfish). The effects of individual environmental changes (dredging, thermal or chemical pollution, etc.) have been determined for certain species. The possible effects of each one of all the major changes which have or are likely to occur in the Bay system have not been determined for a single species.

17486. Powell, Madison R. (Ala. Marine Res. Lab., P. O. Box 188, Dauphin Island, Alabama 36528). 1973. CAGE AND RACEWAY CULTURE OF STRIPED BASS IN BRACKISH WATER IN ALABAMA. Proc. 26th Ann. Conf. SE Assn. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 345-356.

Cage and raceway culture of striped bass, Morone saxatilis (Walbaum), in brackish water was conducted at the Marine Resources Laboratory, Dauphin Island, Alabama during the period 1 July 1971 to 2 November 1971. The effects of two feeds and two feeding regimes on the growth, food conversion and survival of fingerlings cultured in 1/2" mesh cages (1 $yd.^3$) were studied. Growth, food conversion and percentage survival was better among fish fed the trout chow. The feeding regime of four times daily enhanced growth and survival among fish fed either of the two diets. Striped bass cultured in a 760-gallon circular raceway increased their weight by 832 percent over a 93 day period. Overall food conversion and percentage survival was 2.0 and 94.1, respectively. Results of a stocking density experiment involving fish stocked in cages at rates of 100, 200 and 300 per $yd.^3$ are discussed. (Auth.)

17487. Cairns, John, Jr., Richard E. Sparks, and William T. Waller (Va. Polytechnic Inst. and State Univ., Blacksburg, Virginia 24061). 1973. THE USE OF FISH AS SENSORS IN INDUSTRIAL WASTE LINES TO PREVENT FISH KILLS. Hydrobiologia, 41(2): 151-167.

17488. Cameron, James N., and John A. Polhemus (Inst. of Arctic Biol., Univ. of Alaska, Fairbanks, Alaska). 1974. THEORY OF CO_2 EXCHANGE IN TROUT GILLS. J. Exp. Biol., 60(1): 183-194.

A computer simulation of countercurrent CO_2 exchange in fish gills was constructed to examine effects of variations in blood and water flow rates. CO_2 output was sensitive to both blood and water flow rates, contrary to experimental data. Various explanations of the contradiction are discussed, including patterns of gill perfusion and possible shunting of blood. A simplified version of the model was also used to demonstrate extreme sensitivity of CO_2 efflux to variations of the residence time of blood in the gills. Data from the literature on reaction rate constants for the CO_2/carbonate/ bicarbonate system are summarized, and the importance of some of these reactions is examined. (Authors' summ.)

17489. Gunderson, Donald R. (Wash. State Dept. of Fish., Fish. Center, Univ. of Washington, Seattle, Wash. 98105). 1974. AVAILABILITY, SIZE COMPOSITION, AGE COMPOSITION, AND GROWTH CHARACTERISTICS OF PACIFIC OCEAN PERCH (Sebastes alutus) OFF THE NORTHERN WASHINGTON COAST DURING 1967-72. J. Fish. Res. Board Can., 31(1): 21-34.

Cruises were conducted off the northern Washington coast each year during 1967-72 to study trends in the availability and biological characteristics of Pacific Ocean perch (Sebastes alutus). There were marked differences in catch rate between cruises, and corresponding differences in age composition and age-length structure indicated that they resulted from differential availability of an old, slow-growing segment of the population to on-bottom trawling. Females from this segment of the population were particularly available when the cruise coincided with the period of peak spawning, and both sexes were available during the 1972 summer cruise. Within cruises, adults from different portions of the bathymetric range showed similar age composition, but there was an inverse relationship between depth and size attained by age 15. Size compositions consequently contained a smaller proportion of large fish as depth increased. Juveniles were confined to the shallow portions of the bathymetric range. There were obvious between-year changes in the length and age composition of juveniles, caused by the temporal progression of a dominant 1961 year-class. Fluctuations in availability make it difficult to monitor changes in mortality and since age composition also varies with availability, the problem is compounded further. Unless all segments of the population are located and sampled in proportion to their abundance, estimates of mortality can be made only between those cruises where the old, slow-growing component of the population is equally available. (Auth.)

17490. Esch, Gerald W., and William J. Huffines (Dept. Biol., Wake Forest Univ., Winston-Salem, North Carolina). 1973. HISTOPATHOLOGY ASSOCIATED WITH ENDOPARASITIC HELMINTHS IN BASS. J. Parasitology, 59(2): 306-313; Fish Health News, 3(1): p. 7.

Histopathologic changes in the smallmouth bass (Micropterus dolomieui), induced by parasitic helminths, were evaluated. Tissues studied were from gonads, ceca, intestine, and spleen. These were removed from bass categorized by age, sex, and size, and according to the season of the year. In the intestine and ceca, most damage (mucosal erosion, fibrosis, and chronic inflammation) was induced by the acanthocephalan Leptorhynchoides thecatus. The extent of the structural damage was mostly related to the number of parasites present. In the spleen, liver, and gonads, severe pathological changes were associated with the migration of the plerocercoid of Proteocephalus ambloplitis. Cellular response of bass to enteric and parenteric parasites always included increases in numbers of globular, eosinophilic leukocytes. In no case was parasite-induced sterility apparent. In this regard, younger and smaller male bass exhibited more severe and more extensive structural debasement of the gonads than males of other size and age classes and than females of any size or age group. This was not due so much to worm burden as it was to the size of the gonad in relation to the size of the plerocercoids. (Authors)

17491. Holden, M. J., and T. Williams (Min. of Agric., Fish. and Food, Fish. Lab., Lowestoft, Suffolk, England). 1974. THE BIOLOGY, MOVEMENTS AND POPULATION DYNAMICS OF BASS, Dicentrarchus labrax, IN ENGLISH WATERS. J. Mar. Biol. Assoc. U.K., 54(1): 91-107.

Nine hundred and fifty-four bass were tagged, mainly by anglers, in the river estuaries and off the coasts of Cornwall, Devonshire, Dorset and Hampshire, England, in 1970 and 1971. To date 59 bass have been recaptured, 86% by anglers, 12% by commercial fishermen and 2% by research vessels. Forty-seven bass were recaptured within 16 km of their release point. Of the 12 bass recaptured at a greater distance, four were taken within 90 days and had moved by an average of 1.4 km/day. From the tag returns and the length distributions of the bass tagged by areas it is concluded that bass form permanent populations in estuaries until they are 2-3 years old, when they move offshore, eventually becoming very mobile as evidenced by the long-distance movements observed. Instantaneous fishing mortality rates, estimated from the rate of tag returns, were between 0.16 and 0.22 (15-20% a year) for bass populations in estuaries and 0.09-0.18 (9-16% a year) for those offshore, with the lower value being the most probable for the offshore population. Calculation of yield curves showed that at these levels of fishing mortality the maximum sustainable yield per recruit is being obtained. Raising the effective age of recruitment to at least 6 years would give a higher yield per recruit, which would be less sensitive to variations in the fishing mortality rate, and increase the average weight of fish in the catch. Using the fishing mortality rates and published age composition data estimates of relative year-class size since 1945 were made. They showed that recruitment has declined by 64-76% between the two periods 1945-9 and 1958-62, the last 5-year period for which data are available. There are considerable variations in year-class size, which appear to be related to high sea temperatures and low wind speeds from a southerly direction from May to September. Results from other bass tagging experiments are discussed and it is concluded that deductions made from other experiments, that bass form localized populations, have resulted from tagging taking place into areas where bass are most abundant and where fishing intensity is highest. It is concluded that there is a single stock of bass in British waters. The pattern of tag returns suggests that the highest stock density is around the Cornish peninsula throughout the year but that the boundary of the stock alters seasonally. In winter the stock is confined mainly to the sea area southwest of England, but in late spring and summer its boundary extends both northwards through the Irish Sea and eastwards along the English Channel and into the North Sea. There is a return movement in late autumn. These movements ensure mixing in the offshore population. (Authors)

17492. Turner, William R. (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. ESTIMATING YEAR-CLASS STRENGTH OF JUVENILE MENHADEN. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Technical publication No. 1, pp. 37-47.

Three methods of sampling for juvenile Atlantic menhaden, Brevoortia tyrannus, were developed from 1961-66. These were mark-recapturing, beach seining, and surface trawling. All three methods were used to measure year-class strength along the Atlantic coast and all gave similar results. Surface trawling was more versatile, expedient, and efficient for coastwide use. The surface trawl method was standardized for systematic sampling. Sampling problems are discussed. (Auth.)

17493. Paperna, I., and D. E. Zwerner (Va. Inst. of Mar. Sci., Gloucester Point, Virginia). 1974. MASSIVE LEECH INFESTATION ON A WHITE CATFISH (Ictalurus catus): A HISTOPATHOLOGICAL CONSIDERATION. Proc. Helminthol. Soc. Wash., 41(1): 64-67.

A massive infestation by the leech, Cystobranchus virginicus Hoffman, 1964, on a white catfish, Ictalurus catus, captured in the York River, Virginia, is described. The histopathological changes in the dermis and epidermis at the attachment sites of the leeches included extensive granulation, focal epithelioma, and displacement of the epithelial and dermal layers with subsequent proliferation. (Authors)

17494. Dodson, Julian J., and William C. Leggett (Dept. of Biol., McGill Univ., P. O. Box 6070, Montreal 101, Quebec, Canada). 1973. BEHAVIOR OF ADULT AMERICAN SHAD (Alosa sapidissima) HOMING TO THE CONNECTICUT RIVER FROM LONG ISLAND SOUND. J. Fish. Res. Board Can., 30(12): 1847-1860.

The migratory behavior of American shad (Alosa sapidissima) approaching their natal river during the final saltwater stage of the spawning migration was studied using ultrasonic tracking and conventional tagging procedures. Initial displacement of most sonic-tagged shad released without displacement adjacent to and 10 km west of the Connecticut River was not in the direction of the home river. These fish, however, homed successfully to the Connecticut River as did dart-tagged shad released in the same areas. Shad exhibited two major behavior patterns; countercurrent orientation in response to the reversing tidal current and adjustment of swimming speed to changes in tidal velocity. Countercurrent orientation was equally significant during daylight and darkness, whereas the adjustment of swimming speeds to tidal current velocity was more significant during daylight than darkness. Shad tracked to the west exhibited a westerly bias inherent in the basic open water behavior patterns. Shad exhibited a greater degree of directed movement when oriented against the ebb tide and adjusted their swimming speeds to exceed the ebb tide velocity and to approximately equal the flood tide velocity. Shad tracked to the east exhibited the same major behavior patterns but with the opposite directional bias. A hypothesis is presented suggesting that the location of the home river is achieved by means of nonrandom search. Environmental clues indicative of the Connecticut River act to establish a preferred direction of displacement while the actual unidirectional displacement is achieved by reference to the rate and direction of tidal currents. (Authors)

17495. Lord, Gary E. (Fish. Res. Inst., Univ. of Wash., Seattle, Washington 98195). 1973. CHARACTERIZATION OF THE OPTIMUM DATA ACQUISITION AND MANAGEMENT OF A SALMON FISHERY AS A STOCHASTIC DYNAMIC PROGRAM. NOAA Fish. Bull., 71(4): 1029-1037.

The optimum data acquisition and management of a typical Bristol Bay sockeye salmon fishery have been expressed as a problem in statistical decision theory. Optimality has been defined as that set of sequential decision rules that minimizes the Bayes risk over the duration of the run. Economic losses or costs are ascribed to acquisition of catch and escapement data in such a manner that an optimal data acquisition scheme can be defined in addition to defining the set of optimal management strategies. (Auth.)

17496. Voigtlander, Clyde W., and Thomas E. Wissing (Lab. of Limnol., Univ. of Wis., Madison, Wisconsin 53706). 1974. FOOD HABITS OF YOUNG AND YEARLING WHITE BASS, Morone chrysops (Rafinesque), IN LAKE MENDOTA, WISCONSIN. Trans. Amer. Fish. Soc., 103(1): 25-31.

Food habits of young and yearling white bass, Morone chrysops, were determined on the basis of seven sets of samples taken at approximate 2-hr intervals from sunset to sunrise in midsummer and early autumn of 1966 and 1967. Digestion rate studies were carried out in situ and in the laboratory. In most cases young and yearling fish evacuated a major share of their stomach contents within 7 to 8 hr after termination of feeding. Laboratory and field data suggest that the major feeding activity of both age groups occurred prior to sunset; young fish apparently ceased feeding at 2 to 3 hr post-sunset while yearlings continued to feed at low levels throughout the night. Both age groups fed heavily on Daphnia spp. and Leptodora kindtii, but yearlings also showed heavy dependence on macroinvertebrates (Amphipoda, Diptera and Odonata) and fish (principally Centrarchidae and Cyprinidae) in later post-sunset hours. (Authors)

17497. Jester, Douglas B. 1973. LIFE HISTORY, ECOLOGY, AND MANAGEMENT OF THE SMALLMOUTH BUFFALO, Ictiobus bubalus (Rafinesque), WITH REFERENCE TO ELEPHANT BUTTE LAKE. New Mexico State Univ., Agric. Exp. Station Research Report 261, 111 p., illus.

17498. Chevalier, J. R. (Inst. of Paper Chemistry, Appleton, Wisconsin). 1973. TOXICITY OF SODIUM SULFIDE TO COMMON SHINERS -- DYNAMIC BIOASSAY. Tappi, 56(5): 135-136; Selected Water Resources Abstracts, 7(6): 56.

Common shiners, Notropis cornutus (Mitchill) were exposed to sodium sulfide in concentrations of 0.33 to 3.95 ppm, using a dynamic bioassay procedure to assure continuous exposure and prevent oxygen depletion in the aquaria. The dilution water (purified by reverse osmosis and held chemically constant) and the test solution (mixed at 300 ppm sodium sulfide) were delivered separately by two mechanical proportioning pumps into 12 aquaria containing 5 different toxicant concentrations plus a control in two duplicate test series. Median tolerance limits (TL50) were calculated and found to be 2.68, 1.72, and 1.64 ppm for 24, 48, and 96 hr exposures. These values are only about one-half those found in static bioassays. The apparent decrease in TL50 may be partly attributable to the instability of sodium sulfide in solution. The true TL50 values may be still lower than the dynamically measured values. The observed lability of sulfide emphasizes the need to consider the extent of conversion or removal of such toxicants by natural processes when setting ambient river quality standards. (Auth.)

17499. Loch, J. S., and L. A. Gregory (Resource Mgmt. Branch, Fish. Operations Directorate, Central Region, Winnipeg, Manitoba, Canada). 1973. A BENTHIC SURVEY OF THE RED RIVER IN THE VICINITY OF AN OIL REFINERY. Environ. Canada, Technical Report Series No. CEN/T-73-11, 26 p.

Qualitative and quantitative benthic indices were used to assess the benthic diversity in the Red River downstream from the City of Winnipeg in the vicinity of an oil refinery outfall. The results from Ponar grab and rock cage samples suggested that the refinery effluent was detrimental to the benthic community diversity at the outfall and that the effect was restricted to less than 3/4 mile downstream on the outfall side of the river. (Authors)

17500. Westman, Kai, Jukka Sutela, Jouni Kitti, and Olli Sumari (Riista- ja kalatalouden tutkimuslaitos, kalantutkimusosasto, Pitkänsillanranta 1 A, 00530 Helsinki 53, Finland). 1973. THE OCCURRENCE OF THE CRAYFISH PLAGUE, Aphanomyces astaci Schikora, IN FINLAND IN THE YEARS 1893-1972. (Rapuruton Esiintymisalueet Suomessa Vuosina 1893-1972). Riista- ja kalatalouden tutkimuslaitos, kalantutkimusosasto, tiedonantoja, 2(1): 1-54. In Finnish.

Inquiries made by the Finnish Game and Fisheries Research Institute and the study of the literature have yielded a total of 1067 crayfish plague (Aphanomyces astaci Schikora) records from Finland. During the years 1893-1972 the plague spread to 750 waters and 46 water-courses inhabited by the native crayfish species Astacus astacus L. (Authors)

17501. Berry, Frederick H., and William J. Richards (NMFS, Miami Laboratory, Miami, Florida 33149). 1973. CHARACTERS USEFUL TO THE STUDY OF LARVAL FISHES. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publn. No. 1, pp. 48-65.

Guidelines useful in the identification of fish larvae are summarized. A "dynamic" approach, wherein the smallest larva is described in detail followed by description of developmental sequences of individual characters and structures, is most desirable. Myomere-vertebrae meristics are somewhat more valuable than caudal fin meristics and morphology in making positive identification because, in most species, myomere complement is completed early in the larval stage. Description of fins must include not only fin meristics, but also their morphology and morphometry. The caudal fin is valuable in identification because caudal fin rays are generally the first to develop and harden and because, in many cases, the number and arrangement of the principal rays are uniform within orders and families. Recommendations are given for terminology and routine measurements. (Authors)

17502. Griffith, Robert W., Bruce L. Umminger, Blake F. Grant, Peter K. T. Pang, and Grace E. Pickford (Dept. of Biol. Yale Univ., New Haven, Connecticut 06520). 1974. SERUM COMPOSITION OF THE COELACANTH, Latimeria chalumnae Smith. Reprint from: J. Exp. Zool, 187(1): 87-101.

17503. Demael-Suard, A., D. Garin, G. Brichon, M. Mure, and G. Peres (Lab. de Physiol. gen. et comp., Univ. Claude Bernard, Lyon, France). 1974. NEOGLYCOGENESIS STARTING FROM GLYCINE ^{14}C IN THE TENCH (Tinca vulgaris L.) IN THE COURSE OF ASPHYXIA. [Neoglycogenese a Partir de la Glycine ^{14}C chez la Tanche (Tinca vulgaris L.) au cours de l 'Asphyxie]. Comp. Biochem. Physiol., 47(3A): 1023-1033.

Tench (Tinca vulgaris L.) received an intracoelomic injection of ^{14}C glycine (1 μCi). ^{14}C is quickly and considerably incorporated into hepatic glycogen. The fish show after the injection the usual reactions of epinephrine release. These reactions are corrected by a hypoglycemic-like regulation before the fifth hour. Tench, which are treated in the same way and immediately asphyxiated in a closed tank, show a slight hepatic glycogenolysis. The glycogen stores stay unchanged thanks to neoglycogenesis from a small amount of radioactive muscular lactate. When asphyxia increases, the hepatopancreas releases insulin which favours amino acid and glucose uptake by muscle. Subsequently the cortisol secretion helps to restore the hepatic glycogen stores. (Authors)

17504. Kosheleva, V. V. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Institut Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. ACCUMULATION OF RADIOACTIVE ISOTOPES BY THE DEVELOPING EGGS OF THE ATLANTIC SALMON. Trans. from Trudy Polyar Nauch Issled. pp. 7-15, AEC Translation 7418; Selected Water Resources Abstracts, 7(4): p. 61.

A study was made of the effect of radioisotopes and the products of nuclear fission for three radioactivity levels. Data were collected on the distribution of activity (in percentage of the total) in the egg membrane, in the fluid of perivitelline space, in the embryonal body and in the yolk. The dynamics of viability of embryos during the incubation period was clarified. It was found that the hatching period for embryos developing in water with radioisotopes lasts a longer time. It was also found that the products of nuclear fission and Ce144 cause greater changes than Cs137 and Sr90 + Y90.

17505. Gillman, D. V., and L. W. Dahlke (Resource Mgmt Branch, Fish. Operations Directorate, Central Region, Winnipeg, Manitoba, Canada). 1973. SPORT FISHERIES IN THE BRABANT ISLAND, BEAVER LAKE AND HAY RIVER AREAS OF THE NORTHWEST TERRITORIES, 1972. Dept. of Environ., Data Report Series No. CEN/D-73-2, 34 p.

Brabant Island – A creel census in the Brabant Island area from June 19 to July 25, 1972 revealed that 175 anglers caught 698 grayling in 271 hours. Of these 523 were retained by anglers. A total of 326 angled grayling were sampled for length, weight, sex, maturity and scales. The length-weight relationship for 211 grayling was given by the equation: $\ln W = -10.665 + 2.8079 (\ln L)$. Ages from 211 grayling ranged 3 to 9 with age 6 the most abundant. Growth rate was greater among the younger age classes. Condition factors of grayling were found to be relatively constant from ages 3 to 9. The mean condition factor was 1.12. The ratio of males and females for 211 Brabant Island grayling was 3:1. Ninety percent of grayling age five and over were found to be sexually mature. The total annual mortality of Brabant Island grayling collected during 1972, based on fish aged 7 to 9, was 65 percent. Beaver Lake – A creel census on Beaver Lake from July 1 to 17, 1972 determined that 141 fishermen caught 1,905 northern pike in 625 fishing hours. Ninety percent of the fish were released. A total of 84 northern pike were sampled for length, weight, sex, maturity and age. The length-weight relationship of 84 northern pike was determined as: $\ln W = -10.665 + 2.0879 (\ln L)$. Northern pike ranged in age from 9 to 27. The mean age of northern pike aged was 13.7. Growth rate was found to be greatest for fish 15 years and older. Females demonstrated a more rapid increase in weight than males after age 12. Of 84 northern pike sampled from Beaver Lake during 1972, 57 were female, and 27 were male (2:1). Maturation occurs before the ninth year, as all fish taken were mature. Hay River – Fifty-three fishermen in the vicinity of Vale Island on the Hay River spent 69.5 hours fishing and caught 56 pike, walleye, lake trout and whitefish. (Authors' summ.)

17506. Khoroshko, P. N. (Central Inst. of Sturgeon Fishery, Astrakhan', USSR). 1973. STURGEON REPRODUCTION IN THE VOLGA BASIN. Hydrobiological Journal, 9(1): 27-33.

Based on long-term studies, the author compiled a list of sturgeon spawning grounds in the Volga and its tributaries. The free stretch between the original bed from Volgograd to the sea (constituting 12% of the spawning area in the basin) is shown to be the main factor in their natural reproduction. The reproduction of all sturgeon species here may provide 50,000 to 55,000 centners of the annual catch. (Auth.)

17507. Barton, J. R., E. J. Peters, D. A. White, and P. V. Winger. 1972. BIBLIOGRAPHY ON THE PHYSICAL ALTERATION OF THE AQUATIC HABITAT (CHANNELIZATION) AND STREAM IMPROVEMENT. Brigham Young Univ. Publications, 30 p. (on sale from BYU Press, 205 UPB, Provo, Utah 84601 for $1.60).

Stream channelization and dredging have destroyed many miles of pristine stream in the United States. Since water and water systems are important to the well-being and development of man, rehabilitation and preservation of water systems are a necessity. Extensive research will be needed on all aspects of habitat destruction and rehabilitation. It is hoped that this bibliography will facilitate any literature review on this subject. A total of 460 references are included. (Authors)

17508. Barr, David. 1973. METHODS FOR THE COLLECTION, PRESERVATION, AND STUDY OF WATER MITES (ACARI: PARASITENGONA). Life Sci. Misc. Publ., R. Ont. Mus. No. ISBN 0-88854-148-1, 28 p.

Methods required for the systematic study of water mites include new techniques that complement or replace some already in existence. Netting, trapping, and separation procedures are described for mites collected from lentic, lotic, moss, water-film, and phreaticolous habitats. The most useful larval specimens are obtained by collecting gravid females and harvesting larvae hatched from eggs deposited in the laboratory. Fluid storage is preferable for most specimens. A versatile method of examining exoskeletal morphology is to observe temporary slide mounts with light microscopy (bright-field, interference contrast, or phase contrast). Scanning electron microscopy of desiccated mites enhances the study of surface fine-structure but does not replace conventional techniques of illustration (line drawings, photomicrography). (Auth.)

17509. Funk, John L. (Mo. Dept. of Conserv., 1110 College Ave., Columbia, Missouri 65201). 1973. CHARACTERISTICS OF CHANNELS FOR WARM-WATER FISHERIES. In: Wildlife and water management: striking a balance. Soil Conservation Soc. of America, 7515 N.E. Ankeny Rd, Ankeny, Iowa, pp. 1-7.

In this first paper in an eight-paper symposium dealing with stream channelization and wetland drainage, the author attempts to explain stream ecology in terms understandable to a person without training in aquatic biology. The emphasis throughout is upon diversity. Streams are diverse in size, in morphology (gradient, pools and riffles, meanders) and in bottom material. Production is based on a diverse periphyton community, which supports a very diverse community of benthic invertebrates, which in turn supports the fish community. The diversity of the fish community is due to adaptation of the individual species to the great variety of physical, chemical and biological conditions in various stream environments. Man-made channels cannot equal natural channels in diversity. Streams should be channelized only as a last resort and channels should be made as diverse as possible. The account is much over-simplified but complete within the limitations of time and the audience. (Auth.)

17510. Koval', V. P., and A. S. Pashkevichute (Kiev St. Univ., Kiev, USSR). 1973. MONOGENETIC TREMATODES OF THE GENUS Diplozoon Nordmann IN FISHES FROM BODIES OF WATER IN THE UKRAINE. Hydrobiological Journal, 9(1): 39-44.

Presents summary of data on the genus Diplozoon in fishes from bodies of water in the Ukraine. Some of the species and subspecies of the genus are found to be identical. (Authors)

17511. Stalling, David L., and James N. Huckins (Fish-Pesticide Res. Lab., Bur. Sport Fish. & Wildl., Columbia, Missouri 65201). 1973. REVERSE PHASE THIN LAYER CHROMATOGRAPHY OF SOME AROCLORS, HALOWAXES, AND PESTICIDES. J. Assoc. Off. Anal. Chem., 56(2): 367-372.

The components of Aroclors 1232, 1248, 1254, and 1260; Halowaxes 1099, 1013, and 1014; and several chlorinated pesticides are resolved by reverse phase thin layer chromatography (RPTLC), which permits component separation by partition between a nonpolar stationary phase and a polar mobile phase. R_f values of resulting spots were calculated for 2 of 4 new solvent systems (mobile phases). RPTLC patterns were reproducible and characteristic of each material examined. The spots were recovered from the plates and characterized by gas-liquid chromatography (GLC) and/or GLC-mass spectrometry. In some cases, single GLC peaks of Aroclor standards were resolved into more than one component by RPTLC, whereas some RPTLC spots of Halowaxes were resolved into as many as 4 GLC peaks. The analysis of environmental residues of chlorinated compounds was facilitated by this technique. (Authors)

17512. Wickham, Donald A., and Gary M. Russell (NMFS, Southeast Fish. Center, NOAA, Pascagoula, Mississippi 39567). 1974. AN EVALUATION OF MID-WATER ARTIFICIAL STRUCTURES FOR ATTRACTING COASTAL PELAGIC FISHES. NOAA Fish. Bull., 72(1): 181-191.

Mid-water artifcial structures positioned off Panama City, Fla. during August 1970 were evaluated to determine their ability to attract coastal pelagic fishes. Quantitative and qualitative experimental results were obtained using scuba divers and purse seine catches. The feasibility of using artificial structures to facilitate the commercial harvest of coastal pelagic fishes with purse seines was established and the methods described. Average catch values of 398 kg (875 lb) per structure were obtained during a period when coastal pelagic fishes were unavailable to the local fishery. A greater total production was obtained from structures fished daily compared with those allowed to soak for 3 days before being fished. Experimental purse seine collections established that fish leave the structures at night with new recruitment occurring daily. No significant differences were obtained from preliminary experiments to evaluate the effects of structure size and color on attraction effectiveness. A working hypothesis is presented to describe apparent behavioral mechanisms involved in the attraction of some species of coastal pelagic schooling fish to objects in the sea. This study indicates that artificial-structure fish-attraction has potential for development as a technique to facilitate the harvest of the latent coastal pelagic fishery resources in the Gulf of Mexico. (Authors)

17513. FAO of the United Nations (Rome, Italy). 1973. SURVEY OF THE WORLD AGRICULTURAL DOCUMENTATION SERVICES. FAO/DC/AGRIS 6, 219 p.

Results are presented of a world survey of secondary documentation services in the fields of agriculture, fisheries, food science and technology and related subjects. Statistical and descriptive data, mostly relating to the year 1971, are given for 124 title and 230 abstract services operating in 41 countries and having a total annual output of 632,000 title citations and 1,137,000 abstracts. Output of title citations by country was highest for the USA with 34% of the total, followed by France with 17%, UK 9%, Netherlands 7% and Federal Republic of Germany with 6%. For abstracts, output was highest for the USA with 35% of the total, USSR 12%, UK and Czechoslovakia each with 9%, France 7%, Federal Republic of Germany 5% and Netherlands 3%. 46% of the total output of abstracts was published in English, followed by 13% for Russian, 9% for French and 8% for Czech. Twenty-nine title services and 45 abstract services used computerized data processing methods.

17514. Matthes, H. (Freshwater Fish. Res. and Training Inst., Mwanza, Tanzania, Africa). 1973. A BIBLIOGRAPHY OF AFRICAN FRESHWATER FISH (Bibliographie des Poissons d'eau Douce de l'Afrique). FAO Dept. of Fish., Fish. Resources Div., 299 p.

17515. Wissing, Thomas E. (Lab. of Limnol., Univ. of Wisconsin, Madison, Wis. 53706). 1974. ENERGY TRANSFORMATIONS BY YOUNG-OF-THE-YEAR WHITE BASS Morone chrysops (Rafinesque) IN LAKE MENDOTA, WISCONSIN. Trans. Amer. Fish. Soc., 103(1): 32-37.

Energy budgets, based on laboratory and field studies in 1967 and 1968, were constructed for young-of-the-year white bass Morone chrysops. Major food items in the diet of the fish were cladocerans, copepods, amphipods, insect larvae and pupae. Estimates of daily food intake were based on two periods of intense feeding (early morning and late afternoon). Fish egested 39% of the food consumed during a single feeding period. Mean caloric content of this material was 3,339 and 3,760 g-cal/g dry weight for laboratory and field samples, respectively. Measurements of the oxygen consumption of groups of fish fed meals of live zooplankton were used to calculate the energy of respiration. Oxygen consumption values were converted to gram-calories with an oxycaloric coefficient of 3.42 g-cal released/mg oxygen consumed. Changes in the total energy content of fish were determined by converting increases in dry weight to their caloric equivalents. Daily food energy consumed by the fish represented about 6% of their total caloric content. Of this, roughly 27% was egested, while the remainder was assimilated and apportioned to growth and maintenance. Ecological growth efficiency was 32.0% during a 36-day period in 1967 and 22.5% during a 40-day period in 1968. The corresponding tissue growth efficiencies were 47.8 and 33.3%. Assimilation efficiency during the two periods averaged about 67%. Possible causes of the observed differences in growth efficiency are discussed. (Auth.)

17516. Zeitoun, I. H., P. I. Tack, J. E. Halver, and D. E. Ullrey (Dept. of Fish. and Wildl., Michigan State Univ., East Lansing, Mich. 48824). 1973. INFLUENCE OF SALINITY ON PROTEIN REQUIREMENTS OF RAINBOW TROUT (Salmo gairdneri) FINGERLINGS. J. Fish. Res. Board Can., 30(12): 1867-1873.

Rainbow trout (Salmo gairdneri) juveniles maintained at 10 and 20 ppt salinity were fed seven diet treatments from 30 to 60% protein in 5% increments for 10 weeks. The fish were stocked in cones, initially 50 fish per cone. Biweekly weights of diets and fish were determined and mortality was recorded daily. Percentage weight gain, gross diet efficiency, and protein efficiency ratio (P.E.R.) were computed. The minimum protein levels required for fish to achieve highest performance using these criteria were 40 and 45% for those maintained at 10 and 20 ppt, respectively. Mortality was significantly ($P < 0.05$) higher for fish maintained at the higher salinity. Analyses of the fish carcasses were conducted at the beginning and end of the experiment on representative samples to estimate the grams protein retained and apparent net protein utilization (N.P.U.) to verify the above findings. All the available data showed that dietary protein was of major consequence on all measurements until the minimum required level of protein in the diet was reached, while salinity was of minor consequence. P.E.R. and apparent N.P.U. were 2.10 and 34.4, respectively, for casein diets at the 40% protein level. (Authors)

17517. Wood, Chris M. (School of Biol. Sci., Univ. of East Anglia, Norwich, England). 1974. A CRITICAL EXAMINATION OF THE PHYSICAL AND ADRENERGIC FACTORS AFFECTING BLOOD FLOW THROUGH THE GILLS OF THE RAINBOW TROUT. J. Exp. Biol., 60(1): 241-265.

Perfusion of the whole gill of Salmo gairdneri with a Newtonian medium under different afferent and efferent pressures has revealed considerable passive distensibility in the branchial vasculature. A capacity for autoregulation may exist. Changes in dorsal aortic pressure are relatively more effective than changes in ventral aortic pressure in altering branchial vascular resistance. Measurements of changes in vascular tone in the gills determined as the ratio of resistances in the experimental and the control states at one point on the pressure differential/flow profile can be extrapolated to the rest of the profile when the comparisons have been made at the same flow. True catecholamines cause a maximum 60% decrease in vascular resistance (at the same flow) by stimulation of B_1-adrenergic receptors in the gills. Branchial dimensions and perfusate viscosities have been measured and, together with the pressure differential/flow data, have been used

to evaluate the Muir-Brown model of vascular resistance in the teleost gill. The model, with some limitations, fits the present data and suggests that both active and passive resistance changes are best explained by alterations in the number of secondary lamellae perfused.

17518. Lovell, R. T. (Dept. of Fish. and Allied Aquacultures, Auburn Univ., Auburn, Alabama 36830). 1973. PROTEIN REQUIREMENTS OF CAGE-CULTURED CHANNEL CATFISH. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 357-361.

Twenty suspended 1-m^3 cages were each stocked with 300 five- to six-inch channel catfish fingerlings to allow for the evaluation of five feeding regimens, each replicated four times. The experiment began April 15 and terminated October 21, providing for a 180-day feeding period. The daily feeding rate was 4% of biomass initially and decreased to 1.5% of biomass during the latter phase of the feeding trial. The experimental feeds were nutritionally complete, low-fiber, expanded (nonsinking) 3/16-inch diameter pellets. Treatments (diets) 1 through 3 contained protein levels of 40, 35, and 30%, with 38% of the protein in each diet coming from fishmeal and the remainder from plant sources. Diet 4 was designed to contain the same theoretical amino acid composition as diet 1 with only 17.5% of the protein coming from fishmeal and the deficient amino acids supplemented in isolated form. The fifth feeding regimen was feeding the 40% protein diet until the fish reached 0.5 lb then feeding the 30% protein diet for the remainder of the period. Mean responses to treatments 1 through 5, respectively, were as follows: weight gain per fish (lb), 1.31, 1.28, 1.24, 0.97 and 1.25; feed conversion ratio, 1.26, 1.26, 1.29, 1.36 and 1.31. Based upon diet ingredient costs treatment 3 effected the least cost per pound of gain, followed by treatments 2, 5, 4, and 1, respectively. (Auth.)

17519. Gee, John H. (Dept. of Zool., Univ. of Manitoba, Winnipeg, Manitoba, Canada). 1974. BEHAVIORAL AND DEVELOPMENTAL PLASTICITY OF BUOYANCY IN THE LONGNOSE, Rhinichthys cataractae, AND BLACKNOSE, R. atratulus (CYPRINIDAE) DACE. J. Fish. Res. Board Can., 31(1): 35-41.

The hypothesis that developmental plasticity contributes to variation in swimbladder length, volume, weight of tissue, and buoyancy was examined in two species of dace. At both maximum and minimum buoyancy attained dace reared in still water to adult size possessed swimbladders of a greater length, volume, and weight of tissue than those reared in current. Such developmental plasticity affected the range over which buoyancy could be adjusted (behavioral plasticity). Those reared in still water attained a more buoyant condition than those reared in current while the latter attained a greater degree of negative buoyancy. (Auth.)

17520. Griswold, Bernard L., and Lloyd L. Smith, Jr. (NMFS, Northeast Fish. Center, NOAA, Woods Hole, Massachusetts 02543). 1973. THE LIFE HISTORY AND TROPHIC RELATIONSHIP OF THE NINESPINE STICKLEBACK, Pungitius pungitius, IN THE APOSTLE ISLANDS AREA OF LAKE SUPERIOR. NOAA Fish. Bull, 71(4): 1039-1060.

The ninespine stickleback is an important food of juvenile lake trout in the Apostle Islands area. It is the most numerous fish of the area and is distributed in deep waters during the winter and in shallow waters during the summer. Females grow faster than males, reaching an average total length of 80 mm at age 5. Males live to age 3 and attain an average length of 66 mm. Annulus formation on otoliths is complete by mid-July. Seasonal growth is more than half complete by early August; growth of mature females is delayed until after spawning. Both sexes mature over a period of 3 yr. Spawning occurs from mid-June to late July. Males apparently do not live as long as females, possibly because of a post-spawning mortality. Egg number is a linear function of fish length, although this relationship is different for fish from two separate areas. Environmental differences between these areas, which may affect spawning time, possibly cause the differences in fecundity. Significant quantities of maturing eggs atrophy just prior to spawning, a phenomenon which changes the fecundity relationship. Sticklebacks eat a variety of invertebrates, particularly the crustaceans Mysis relicta and Pontoporeia affinis.

Food eaten by the stickleback and slimy sculpin is similar, but the adaptability of both species tends to eliminate serious competition. The lake trout is the only serious predator of stickleback. (Authors)

17521. Pierce, Robert J., and Thomas Wissing (Dept. of Zool., Miami Univ., Oxford, Ohio 45046). 1974. ENERGY COST OF FOOD UTILIZATION IN THE BLUEGILL (Lepomis macrochirus). Trans. Amer. Fish. Soc., 103(1): 38-45.

A respirometer was utilized to determine the energy cost of food utilization in the bluegill Lepomis macrochirus. Prior to the study, fish were acclimated to the experimental photoperiod (16 hr light) and temperature (15, 20 and 25 C) for 90 and 14 days, respectively. Each fish was tested in the respirometer for 3-day periods. After an initial acclimation period of 24 hr, metabolic rates were determined at 2-hr intervals for the next 48 hr and were converted to their caloric equivalents. Fish were fed to satiation on mayfly nymphs (Hexagenia limbata) in the morning and evening of day 3. We calculated the energy cost of food utilization by determining the increase in energy of respiration subsequent to feeding. Metabolic rates ranged from 30.7 to 160.9 mg O_2/kg-hr. Nocturnal rates were 26% higher for both fed and unfed fish at each experimental temperature. Daily food intake was influenced somewhat by body weight and temperature. Values ranged from 1.16 to 3.43% of the wet weight of the fish. Energy expenditure for food utilization ranged from 4.8 to 24.4% ($\bar{X} = 12.7 \pm 1.5$) of the caloric content of the daily ration. Specific Dynamic Action, that is, the energy freed and lost through protein catabolism, probably comprises a large share of the energy cost of food utilization. (Authors)

17522. Brown, J. T., and W. W. Hassler (No. Carolina Div. of Comm. and Sport Fish., No. Carolina State Univ., Raleigh, N. C. 27607). 1973. A NOMOGRAPH FOR AGE DETERMINATION OF STRIPED BASS (Morone saxatilis) EGGS. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, p. 66.

A nomograph technique can be used to derive the time interval from 13 selected stages to hatching of striped bass eggs. Values are drawn from material subjected to a temperature range of 15.0° to 22.0°C (59° to 72°F). After egg development, stages are determined from plankton net samples. Use of this technique permits a determination of river area and time of spawning when stream flow is known. (Authors)

17523. Migalovskiy, I. P. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Inst. Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. DEVELOPMENT OF ATLANTIC SALMON EGGS UNDER CONDITIONS OF RADIOACTIVE CONTAMINATION OF WATER BY STRONTIUM-90 - YTTRIUM-90 AND CERIUM-144. AEC Translation 7418 from Trudy Polyar Nauch. Issled. pp. 16-30.

A study was made of the effect of radioactive isotopes Sr90 + Y90 (5.10 to the minus 6th power curie/liter, 5.10 to the minus 8th power curie/liter, 5.10 to the minus 10th power curie/liter) and Ce144 (3.10 to the minus 6th power curie/liter, 3.10 to the minus 8th power curie/liter, 3.10 to the minus 9th power curie/liter) on the embryonal development of the Atlantic salmon (Salmo salar L.). The action of the isotopes is manifested in lengthening of the hatching period, appearance of deformed embryos and larvae, in an increased death of eggs and larvae; for Ce144 it begins with a radioactivity level 3.10 to the minus 9th power curie/liter and for Sr90 + Y90 it begins with 5.10 to the minus 10th power curie/liter. In addition, at all Ce144 radioactivity levels up to the stage of onset of gastrulation there is an increased development rate. The dependence of the types of deformities on the specific action of the used isotopes was established.

17524. McLeay, D. J. (Dept. of Zool, Univ. of British Columbia, Vancouver, Br. Columbia, Canada). 1973. EFFECTS OF ACTH ON THE PITUITARY INTERRENAL AXIS AND ABUNDANCE OF WHITE BLOOD CELL TYPES IN JUVENILE COHO SALMON, Oncorhynchus kisutch. Gen. Comp. Endocrinol., 21(3): 431-440.

17525. Ritter, John A., and Hugh R. MacCrimmon (Dept. of Zool., Univ. of Guelph, Guelph, Ontario, Canada). 1973. EFFECTS OF ILLUMINATION ON BEHAVIOR OF WILD BROWN (Salmo trutta) AND RAINBOW TROUT (Salmo gairdneri) EXPOSED TO BLACK AND WHITE BACKGROUNDS. J. Fish. Res. Board Can., 30(12): 1875-1880.

Wild brown (Salmo trutta) and rainbow trout (Salmo gairdneri) placed in a circular tank illuminated at 10^{-2} lx immediately selected black rather than white background. Preference for black fluctuated with activity during the first 2 hr while both selection of black and activity gradually decreased with habituation over the following 84 hr. A sudden increase in illumination to 200 lx reestablished the strong selection of black which decreased rapidly with rising activity. Selection of black was inversely correlated with activity of the fish and was greater under moving than nonmoving water conditions. Differences in activity levels between rainbow and brown trout caused minor differences in response to background. Temporal preference for black background is interpreted as a protective response to the fright stimuli of initial handling, unfamiliarity with the experimental tank, and sudden increase in illumination. Duration of the response after the sudden increase in illumination was less in brown than rainbow trout. Because of its influence on activity and selection of light or dark backgrounds, light is an important ecological factor for trout. (Authors)

17526. Gall, G. A. E. 1974. INFLUENCE OF SIZE OF EGGS AND AGE OF FEMALE ON HATCHABILITY AND GROWTH IN RAINBOW TROUT. Calif. Fish and Game, 60(1): 26-35.

The egg production of 2- and 3-year-old rainbow trout females and the growth of their progeny to 75 days of age were studied in two consecutive years to evaluate the effect of egg size and age of female on size and growth of fingerlings. Age 2 females produced smaller eggs than age 3 females making it difficult to separate the two effects. There were significant differences between years and ages of females in egg volume, egg size, and egg number per female. There was also a significant year by age interaction which was attributed to differences between the two genetic stocks used in the study. Age 3 females gave a higher percent eyed eggs, and larger, more rapidly growing fingerlings. The age of female effects on fingerling size could be accounted for by regression on egg size. Fingerling growth was affected by both age of female and egg size. (Auth.)

17527. Grant, George C. (Va. Inst. of Mar. Sci., Gloucester Point, Virginia 23062). 1974. THE AGE COMPOSITION OF STRIPED BASS CATCHES IN VIRGINIA RIVERS, 1967-1971, AND A DESCRIPTION OF THE FISHERY. NOAA Fish. Bull., 72(1): 193-199.

The age composition of Virginia catches of the striped bass, Morone saxatilis, is being monitored as one of the parameters important in rational management of the species. Catches of pound nets and fyke nets, relatively nonselective gear types used in estimates of age structure, were sampled semimonthly in three Virginia rivers from July 1967 through June 1971. Seasonal changes in age composition are slight with older, migratory striped bass occurring more frequently in winter and spring catches. Young fish are not caught by these nets in significant numbers until the spring following the year of their hatch. An age group that is dominant in summer usually continues its dominance through the spring of the following year. Differences in age composition of striped bass catches among rivers and years occur as a result of variable year class strength. Although one-year-olds normally dominate catches, two-year-olds may predominate either through local failure of a year class or by continued dominance of a relatively strong year class. A brief description of the striped bass fishery in Virginia is included. (Auth.)

17528. Gulel'makher, D. L. (Inst. of Zool., USSR Acad. of Sci., Leningrad, USSR). 1973. AUTORADIOGRAPHY AS A METHOD OF DETERMINING THE RELATIVE CONTRIBUTION OF INDIVIDUAL ALGAL SPECIES TO THE PRIMARY PRODUCTION OF PLANKTON. Hydrobiological Journal, 9(1): 61-64.

17529. Warren, C. E., W. K. Seim, R. O. Blosser, A. L. Caron, and E. L. Owens (Oregon State Univ., Corvallis, Oregon). 1973. LABORATORY AND CONTROLLED EXPERIMENTAL STREAM STUDIES OF THE EFFECTS OF KRAFT EFFLUENTS ON GROWTH AND PRODUCTION OF SALMONID FISH. In: TAPPI Environmental Conf., San Francisco, May 14-16, preprinted Proc. TAPPI, Atlanta, Georgia, pp. 19-26; Selected Water Resources Abstracts, 7(5): p. 54.

Based on results of a six-year study, neither primary- nor secondary-treated kraft mill effluents impaired the growth of salmonid fish (coho and Chinook salmons, and brown and cutthroat trouts) in aquaria at BOD concentrations below 0.5 g/liter, but did affect the fish at higher concentrations. In laboratory stream communities and experimental stream channels, these effluents had no deleterious effects on salmonid growth and biomass production at BOD concentrations of 0.5 mg/liter, but did change the composition of the benthic community of algae and insects. At the same BOD concentrations, effluents from another kraft mill exerted less effect on aquarial salmonids than those from the first mill studied.

17530. Holbrook, John A., II, Kim W. Primmer, and Alfred C. Fox (Ga. Coop. Fish. Unit, Univ. of Georgia, Athens, Georgia). 1973. EVALUATION OF A MULTI-SPECIES CATFISH POND. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 361-367.

This study was designed to compare the growth, mortality, and catchability of three species of catfish, blue catfish (Ictalurus furcatus), channel catfish (I. punctatus), and white catfish (I. catus), in an artificially fed fishing pond. After stocking in October, 1968, the pond was fished a total of 35 days in two years (1970 and 1971). All remaining fish were then removed. The pond was "contaminated" primarily by brown bullheads and bluegills, with bullheads accounting for 648 pounds of the 2320 pounds per acre removed at the end of the study. Although 90 pounds of bluegill per acre were harvested during the 1971 fishing season, only 62 pounds per acre were present during eradication. Catch rates of all three catfish species were low throughout most of the study. Catch rates of blue catfish and white catfish were lower than channel catfish. "Natural" mortality of blue catfish was less than channel or white catfish. Weight attained by white catfish after four years of growth was considerably lower than either blue or channel catfish. Very few young-of-the-year of any species were found during removal operations. (Authors)

17531. Beamish, Richard J. (Dept. of Environ., Fish. and Mar. Serv., Freshwater Inst., Winnipeg, Manitoba R3T 2N6, Canada). 1974. GROWTH AND SURVIVAL OF WHITE SUCKERS (Catostomus commersoni) IN AN ACIDIFIED LAKE. J. Fish. Res. Board Can., 31(1): 49-54.

White suckers (Catostomus commersoni) in the acidic Lumsden Lake in 1967 and 1968 exhibited reduced annual growth followed by death. The reduced growth and death appeared directly related to the low pH and not to a shortage of food caused by the decreasing pH. (Auth.)

17532. Hambrick, Patrick S., Charles H. Hocutt, Michael T. Masnik, and James H. Wilson (Dept. of Biol., Va. Polytechnic Inst. and State Univ., Blacksburg, Virginia 24061). 1973. ADDITIONS TO THE WEST VIRGINIA ICHTHYOFAUNA, WITH COMMENTS ON THE DISTRIBUTION OF OTHER SPECIES. Proc. of the West Virginia Acad. of Science, 45(1): 58-60.

Fishes collected from the East River, West Virginia, during 1972 are reported upon. The collections resulted in the addition of two new species, Notropis galacturus and Notropis telescopus, to the known West Virginia ichthyofauna. New distributional records for Exoglossum maxillingua, Nocomis l. leptocephalus, Notropis cornutus chrysocephalus, Notropis hudsonius, and Percina crassa roanoka are noted. One species, Etheostoma caeruleum, was added to the fauna of the New (upper Kanawha) River drainage. It is recommended that Nocomis l. leptocephalus, Notropis galacturus, Notropis telescopus, and Percina crassa roanoka be placed on the West Virginia list of rare and endangered fishes. (Authors)

17533. Hill, B. J., and M. S. Coulton (Inst. for Freshwater Studies, Zool. Dept. Rhodes Univ., Grahamstown, So. Africa). 1974. A PRESSURE CHAMBER FOR DETERMINATION OF DEPTH TOLERANCE IN TELEOSTS. J. Fish Biol., 6(1): 61-65.

The construction and operation of a pressure tank suitable for experimental work on teleosts is described. The tank can be used to simulate depths down to 60 m. The design permits water to flow through the tank at all pressures in order to provide oxygen and remove metabolites but there is no increase in dissolved gases with increased pressure. (Authors)

17534. Gérard, J. P., and P. de Kinkelin (Vet. Dept., Lab. d'Ichtyopathologie, Inst. Nat'l de la Recherche Agron., 78 - Thiverval-Grignon, France). 1971. TREATMENT OF ACANTHOCEPHALOSIS OF THE RAINBOW TROUT. (Traitement de l'acanthocephalose de la truite arc-enciel). La Pisciculture Francaise, No. 26, 2nd Trimestre, pp. 22-27; Fish Health News, 3(1): p. 9.

Successful treatment of Acanthocephalosis in rainbow trout caused by Echinorhynchus sp. was achieved by a single oral dose of D^2N COGLA which is Bithional 2,2' - thio bis (4, 6-dichlorphenol). The recommended dosage is 0.2 g per kilogram of body weight. This is equivalent to feeding 2% of body weight of feed containing 2% of the drug. -- S. F. Snieszko

17535. Hill, Thomas K., J. L. Chesness, and E. E. Brown (Dept. of Entomol. and Fish., Coastal Plain Exp. Sta., Tifton, Georgia). 1973. UTILIZATION OF RAINBOW TROUT, Salmo gairdnerii Richardson, IN A DOUBLE-CROP FISH CULTURE SYSTEM IN SOUTH GEORGIA. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 368-376.

Techniques were investigated for growing rainbow trout, Salmo gairdnerii Richardson, from fingerlings to market size during the winter months in a recirculation, flowing water fish culture system where channel catfish, Ictalurus punctatus (Rafinesque) are grown in summer. Trout stocked having a mean weight of 0.1 lb had a mean weight of 0.7 lb in approximately 100 days with a feed conversion ratio of 1.29 to 1. Survival of the fish was 82%. Water quality parameters and control of parasite infestations during the culture period are also discussed. Authors)

17536. Knight, A. W., and R. W. Brocksen (Water Sci. and Engineering, Univ. of Calif., Davis, California). 1972. RESPONSE OF AQUATIC LIFE TO SALINITY, TEMPERATURE, DISSOLVED OXYGEN, AND WATER FLOW. Univ. of Calif. - Davis, Water Resources Center, Ann. Report No. 25, pp. 15-25; Univ. of Wisconsin Eutrophication, Issue No. 38, p. 5, 1973.

Studies were conducted on oppossum shrimp, an important food source for young striped bass, in the Sacramento San Joaquin Delta estuary to determine appropriate temperature and salinity conditions for their survival. Investigated also were the respiratory metabolism of striped bass in various water temperatures, their physiological fitness and stress, and bioenergetics.

17537. McAndrews, John H., Albert A. Berti, and Geoffrey Norris. 1973. KEY TO THE QUATERNARY POLLEN AND SPORES OF THE GREAT LAKES REGION. Life Sci. Misc. Publ., R. Ont. Mus., ISBN 0-88854-149-X, 61 p.

17538. Benziger, David, and Bruce L. Umminger (Dept. of Biol. Sci., Univ. of Cincinnati, Cincinnati, Ohio). 1974. THE EFFECT OF pH AND COLD ACCLIMATION UPON GLUCOSE-6-PHOSPHATASE ACTIVITY IN THE GOLDFISH, Carassius auratus. Comp. Biochem. and Physiol., 47(2B): 243-254.

The pH optimum and specific activity of hepatic glucose-6-phosphatase were examined in the goldfish, Carassius auratus, acclimated to 1, 10 and 20°C. No changes in pH optimum or activity occurred at any of the acclimation temperatures investigated. The pH optimum of goldfish hepatic glucose-6-phosphatase, pH 5.4, is compared to optima of other organisms. The relationship of glucose-6-phosphatase to the hyperglycemia often found in cold-acclimated organisms is discussed. (Authors)

17539. Steimle, Frank W., Jr., and Richard B. Stone (Sandy Hook Lab., Middle Atlantic Coastal Fish. Center, NMFS, NOAA, Highlands, New Jersey 07732). 1973. ABUNDANCE AND DISTRIBUTION OF INSHORE BENTHIC FAUNA OFF SOUTHWESTERN LONG ISLAND, N. Y. NOAA Tech. Report NMFS SSRF-673, 50 p.

This paper describes a qualitative and quantitative census of the inshore benthic fauna off southwest Long Island over the period February 1966 through January 1967, prior to construction of an ocean sewer outfall in the general vicinity. Preliminary analyses of data indicate the presence of three distinct communities: 1) an inshore medium to coarse grain sand community dominated by the bivalve, Tellina agilis, the amphipod, Protohaustorius deichmannae, and the echinoderm, Echinarachnius parma; 2) an offshore silty fine sand community dominated by the bivalve, Nucula proxima, and the polychaete, Nephtys incisa; and 3) a community dominated by the mussel, Mytilus edulis. (Authors)

17540. Applegate, Richard L., Andrew J. Repsys, and Stephen B. Smith (S. D. Coop. Fish. Unit, So. Dakota State Univ., Brookings, So. Dakota 57006). 1973. DISSOLVED ORGANIC MATTER, SESTON, AND ZOOPLANKTON CYCLES IN LAKE POINSETT, SOUTH DAKOTA. Proc. S. D. Acad. Sci., 52: 28-46.

The seasonal cycles of dissolved organic matter, seston, and zooplankton in Lake Poinsett, South Dakota, are described. Fluctuations and species composition are compared to sources of predation and grazing. Lake Poinsett is a eutrophic lake in which nutrients do not appear to be a limiting factor in production. The lake is characterized by a late winter and early spring maxima of unicellular phytoplankton under ice and summer blooms of blue-green algae. Unicellular algae provide a food base for the rapid developmement of herbivore populations in the spring. Daphnia pulex was the predominant herbivore in the spring and grazing pressure is considered responsible for low phytoplankton biomass and chlorophyll level in May and June. Fish predation reduced D. pulex density in June and large species of algae and small species of Crustacea predominated throughout the remainder of the summer. (Authors)

17541. Korn, Sid, and Dan Macedo (NMFS, Tiburon Fish. Lab., Tiburon, California 94920). 1973. DETERMINATION OF FAT CONTENT IN FISH WITH A NONTOXIC, NONINFLAMMABLE SOLVENT. J. Fish. Res. Board Can., 30(12): 1880-1881.

An inexpensive method to determine the fat content in fish using a nontoxic, noninflammable solvent is described. A preweighed, dry, ground fish sample is put in a chromatography column with anhydrous sodium sulfate. One hundred milliliters of monofluorotrichloromethane (MF Freon, refrigerant-11) is poured through the column and the effluent collected in a preweighed beaker. After evaporation of the solvent on a hot plate and cooling in a desiccator, the fat is weighed and fat content calculated. Calculations for samples from two species were similar to those obtained by Association of Official Agricultural Chemists fat extractor method. The column method compares favorably with the fat extractor concerning cost and time. (Authors)

17542. Pacheco, Anthony L., and George C. Grant (NMFS, Atlantic Estuarine Fish. Center, Beaufort, No. Carolina 28516). 1973. IMMATURE FISHES ASSOCIATED WITH LARVAL ATLANTIC MENHADEN AT INDIAN RIVER INLET, DELAWARE, 1958-61. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 78-117.

Plankton sets at Indian River Inlet, Delaware, made from October to May in the years 1958-61, resulted in the collection of 59 species of marine fishes. We compared catches from sets made with 1-m and 1/2-m nets, paired sets with 1-m nets, and a special series of sets made during ebb and flood tidal currents. Night-flood current sets with a 1-m net collected more species and individuals than did day-ebb current sets. Within the 9-month sampling period, six species -- Atlantic menhaden, bay anchovy, American eel, Atlantic silverside, summer and winter flounder -- made up nearly 70% of the catch. A marked annual variation in the catch-per-set occurred for summer flounder, American sand lance, bay anchovy,

Atlantic croaker, Atlantic silversides, and striped cusk-eels. A decline in the catch of Atlantic menhaden, bay anchovy, Atlantic croaker, and summer flounder related to inlet water temperatures below 3.0°C. Various advantages and shortcomings of the techniques and objectives of reported studies are discussed. (Authors)

17543. Moulton, Lawrence L. (Coll. of Fish., Univ. of Wash., Seattle, Washington 98195). 1974. ABUNDANCE, GROWTH, AND SPAWNING OF THE LONGFIN SMELT IN LAKE WASHINGTON. Trans. Amer. Fish. Soc., 103(1): 46-52.

Abundance and growth data indicated a 2-yr life cycle for longfin smelt with even-numbered year-classes being more abundant and showing a lower growth rate than the odd. The Cedar River was the major spawning area. The peak of the spawning adults decreased as the spawning runs progressed. Males were consistently larger than females and dominated in numbers throughout the runs by a 3:2 ratio. The time of the spawning migration was related to body size; the larger adults of the odd year-class spawn earlier in the year than the smaller adults of the even year-class. (Auth.)

17544. Alt, Kenneth T. (Alaska Dept. of Fish & Game, Div. of Sport Fish, Fairbanks, Alaska 99701). 1973. CONTRIBUTIONS TO THE BIOLOGY OF THE BERING CISCO (Coregonus laurettae) IN ALASKA. J. Fish. Res. Board Can., 30(12): 1885-1888.

Taxonomic and biological data are presented on Bering cisco, Coregonus laurettae Bean, from the South Fork of the Kuskokwim River; Hess Creek and the Porcupine River in the Yukon System; and the Koyuk River and Port Clarence-Grantley Harbor area of western Alaska. Gill raker counts ranged from 31-40 with means of 33.8-36.6, those on the lower arch 18-24 with means of 20.4-23.6. Potential spawners were found 1610 km up the Yukon River in mid-June and 262 were taken at the mouth of Hess Creek in the Yukon River 1270 km upstream from the mouth June 10-14, 1972. Bering cisco from Hess Creek grow faster than cisco from Port Clarence-Grantley Harbor, reaching a maximum length of 480 mm and 8 years of age. Growth rates for males and females are similar. (Auth.)

17545. Rogers, Donald E. (Fish. Res. Inst., Coll. of Fish., Univ. of Wash., Seattle, Washington 98195). 1973. ABUNDANCE AND SIZE OF JUVENILE SOCKEYE SALMON, Oncorhynchus nerka, AND ASSOCIATED SPECIES IN LAKE ALEKNAGIK, ALASKA, IN RELATION TO THEIR ENVIRONMENT. NOAA Fish. Bull., 71(4): 1061-1075.

Juvenile sockeye salmon, Oncorhynchus nerka, and associated fish in the littoral of Lake Aleknagik (Bristol Bay, Alaska) were sampled systematically from spring to midsummer (1962-72) with a beach seine. Apparent mortality rate and relative abundance were estimated from catches. Juvenile sockeye salmon and threespine stickleback comprised the majority of the population, and slimy sculpin, ninespine stickleback, and Arctic char fry the remainder. The annual abundance of juvenile sockeye salmon was related to the abundance of parent spawners. No correlation was evident among the annual estimates of abundance of the five species. Age was determined from length-frequency distributions, and growth rates were calculated for sockeye salmon (age 0), Arctic char (age 0), and threespine stickleback (age I). The mean lengths of sockeye salmon fry and char fry on 20 June were positively correlated with water temperature, whereas the mean length of threespine stickleback (age I) on this date was inversely correlated with the average catch of sockeye salmon fry in the previous year. The mean lengths of all species on 20 July were inversely correlated with the mean catch of sockeye salmon fry. A limited capacity of the Lake littoral to sustain growth of individual fish was indicated. (Auth.)

17546. Falk, M. R., M. D. Miller, and S. J. M. Kostiuk. 1973. DATA SUPPLEMENT TO: BIOLOGICAL EFFECTS OF MINING WASTES IN THE NORTHWEST TERRITORIES. Environment Canada, Resource Mgmt. Branch, Central Region Data Report Series No. CEN/D-73-1, 54 p.

17547. Loch, J. S. (Dept. of Zool., Univ. of Manitoba, Winnipeg, Manitoba, Canada). 1974. PHENOTYPIC VARIATION IN THE LAKE WHITEFISH, Coregonus clupeaformis, INDUCED BY INTRODUCTION INTO A NEW ENVIRONMENT. J. Fish. Res. Board Can., 31(1): 55-62.

Adult lake whitefish (Coregonus clupeaformis) from Clearwater Lake and second generation adults of offspring from Clearwater whitefish transplanted to Lyons Lake were compared with respect to morphometric and meristic characters and isozymes of L-glycerol-3-phosphate dehydrogenase (GPDH). Feeding habits and abundance of pelagic and benthic foods were compared in the two lakes. Gill raker number, lateral line scale count, and interorbital width remained constant between parental and offspring populations. Gill raker length was the main character found to differ between the populations. This was found to be related to the percentage and type of benthic food eaten. Abrasion of the gill rakers is offered as an explanation for the differences in gill raker length. Differences were found in various other meristic and morphological characters, as well as in electrophoretic phenotype frequencies of isozymes of GPDH. (Auth.)

17548. Simmons, Mary Ann, Richard M. Sitts, James T. Allen, and Allen W. Knight. 1974. THE NOMENCLATURE FOR MYSIDS IN THE SACRAMENTO-SAN JOAQUIN DELTA ESTUARY. Calif. Fish and Game, 60(1): 23-25.

In consulting the existing literature during the course of laboratory and field studies, confusion arose as to the exact taxon of the Neomysis utilized as a test organism. This paper presents historic and taxonomic evidence for using the name Neomysis intermedia for the mysid from the Sacramento-San Joaquin Delta Estuary which has been called Neomysis awatschensis.

17549. Graynoth, E., and W. Skrzynski (Min. of Agric. and Fish., Wellington, New Zealand). 1973. THE WAIMARINO TROUT FISHERY. TROUT AND SALMON FISHERY. N. Z. Min. of Agric. and Fish., Fish. Tech. Report No. 102, 38 p.

This report describes the trout fisheries of Waimarino Acclimatisation District. It is based on anglers' results collected since 1947 by eight angling diary schemes and one postal questionnaire scheme in 1962. In this district license sales have remained stable for many years. The average Men's Whole Season License Holder fishes for about 24 days per season to catch 20 fish. The total district catch is between 8,000 and 16,000 fish per season. The total expenditure on fishing by Waimarino anglers is about $34,000 per annum. The Wanganui system contains a mixture of brown and rainbow trout in fairly equal proportions, the Wanganui tributaries vary in the composition of trout species. The southern Mangawhero was originally a rainbow trout water, but brown trout are predominant nowadays. Many waters contain large trout and there have been no changes in fish sizes for many years. The density of the stock varies between waters and only a few surveys have been carried out. Indications are that anglers catch relatively few fish present in the waters. There is insufficient scientific information to determine the effectiveness of hatchery liberations. It is suspected that they are of little value. The five principal waters and anglers' catches are described. Fisheries regulations are lenient. Fisheries management is complicated by several drastic changes in the environment which are taking place. (Authors' summ.)

17550. Duman, John G., and Arthur L. DeVries (Scripps Inst. of Oceanogr., Univ. of Calif., San Diego, La Jolla, California). 1974. FREEZING RESISTANCE IN WINTER FLOUNDER Pseudopleuronectes americanus. Nature, 247(5438): 237-238.

Thermal hysteresis and freezing curve data lead to the inference that the mechanism of action of the flounder antifreeze is similar to that of the glycoproteins in Antarctic fish. Acrylamide gel electrophoresis and amino acid analysis indicate that the antifreezes of the two fishes differ markedly in composition. Therefore, it seems that distantly related families of cold water fishes have adapted to freezing conditions by evolving different large molecular weight compounds which, however, possess similar antifreeze activity.

17551. Flickinger, Stephen A. (Colo. Coop. Fish. Unit, Colo. State Univ., Fort Collins, Colorado 80521). 1973. INVESTIGATION OF POND SPAWNING METHODS FOR FATHEAD MINNOWS. Proc. of 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 376-391.

For transfer of fingerling fathead minnows (Pimephales promelas) from spawning ponds to growing ponds, the optimum combination of brood-fish population density and sex ratio in the spawning pond was 19,200 fish per surface acre and five females to one male. Fingerling production from this combination amounted to 1,524,500 fish. Fathead minnows utilized spawning boards placed up to 5 ft deep, and they also utilized boards placed without reference to the substrate. Larger nest sites encouraged larger egg deposits. Nests were crowded together as effectively by restricting available nest sites as by providing visual isolation or territorial markings. Post-spawning mortality of adults ranged from 20% to 91% with higher survival of females than males. (Auth.)

17552. Joseph, Edwin B. (Va. Inst. of Marine Sci., Gloucester Point, Virginia 23062). 1973. ANALYSIS OF A NURSERY GROUND. Proc. of Workshop on Egg, Larval, and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, 118-121.

The present paper examines two environments, one of high salinity and the other of low salinity, believed to be typical of many comparable areas reputed to be important nursery grounds in the middle Atlantic coastal region. (From Auth.'s abstract)

17553. Pearcy, William G., and Sharon S. Myers (School of Oceanogr., Ore. State Univ., Corvallis, Oregon 97331). 1974. LARVAL FISHES OF YAQUINA BAY, OREGON: A NURSERY GROUND FOR MARINE FISHES? NOAA Fish. Bull., 72(1): 201-213.

Based on a survey of planktonic fish larvae, the Yaquina Bay estuary appears important as a spawning or rearing ground only for Clupea harengus pallasi (Pacific herring) and a variety of small cottids, gobies, and stichaeids. Other investigators, however, have found an abundance of juvenile Parophrys vetulus (English sole), Citharichthys stigmaeus (sanddab), Hypomesus pretiosus (surf smelt), Platichthys stellatus (starry flounder) and embiotocids (surf perches), indicating that the bay is an important nursery area for these species. Of the 44 types of larval fishes found in the bay, C. h. pallasi and Lepidogobius lepidus (bay goby) were co-dominants each year, 1960-1970, comprising 90% of all larvae collected. There was no evidence of trends in abundances or species composition during the 11-yr study. Maxima of planktonic fish eggs and L. gobius larvae occurred in the summer; maxima of all larvae combined and most species of larvae occurred in the winter and spring. High densities of larval herring were found in February and March, and peak numbers appeared earlier in the lower than the upper estuary. Larvae of C. h. pallasi, L. lepidus, and Cottus asper were common at all stations from 0.5 to 8 nautical miles up the estuary, but not in the adjacent open ocean. Larvae of many species that were found in the estuary in small numbers were more abundant in offshore waters. Although English sole and sanddab were rare in the bay as larvae, juveniles were numerous. (Authors)

17554. Särkkä, J. (Jyväskylan Yliopisto, Vapaudenkatu 4, 40100 Jyväskylä 10, Finland). 1972. BOTTOM FAUNA OF LAKE KONNEVESI. (Konneveden pohjaeläimistö). Suomen Kalatalous, 46(1): 29-37. In Finnish.

The density of the macrofauna has a minimum at the depth of the thermocline and at the greatest depths. In the profundal the dominant species is Pisidium conventus; in the sublittoral various chironomid larvae dominate. There are no significant differences between the southern and northern parts of the lake in biomasses. The glacial relicts comprised Gammaracanthus lacustris, Pallasea quadrispinosa, Pontoporeia affinis, and Mysis relicta, which have not been found earlier in Lake Konnevesi. The diversity index H' varies between 2.89 and 4.05 and is greatest in the sublittoral. (Auth.)

17555. Degurse, Paul E., David Crochett, and H. R. Nielsen. 1973. OBSERVATIONS ON LAKE MICHIGAN COHO SALMON (Oncorhynchus kisutch) PROPAGATION MORTALITY IN WISCONSIN WITH AN EVALUATION OF THE PESTICIDE RELATIONSHIP. State of Wisconsin Dept. of Nat. Res. Fish. Mgmt. Report No. 62, 11 p.

Conditions limiting coho salmon reproduction are described and their extreme variability noted. Tissue analyses, as performed in this study, have not resolved the pesticide problem in coho salmon. The problem in reproduction, if it is indeed linked to pesticide residues, can only be resolved through further work which would demonstrate the pathway of action of DDT and PCB's. (Authors)

17556. Elrod, Joseph H. (No. Central Reservoir Investigations, Bur. of Sport Fish. and Wildl., Pierre, South Dakota 57501). 1974. ABUNDANCE, GROWTH, SURVIVAL, AND MATURATION OF CHANNEL CATFISH IN LAKE SHARPE, SOUTH DAKOTA. Trans. Amer. Fish. Soc., 103(1): 53-58.

Channel catfish, Ictalurus punctatus (Rafinesque) from Lake Sharpe, a 22,600-ha reservoir on the Missouri River in South Dakota, showed little change in abundance during the first 8 yr of impoundment, 1964-1971. All year classes from 1953 through 1969 were represented in gill net catches. Mean lengths of fish at a given age averaged 20% less in 1971 than in 1964. Average annual survival rate was calculated to be 69% from age VI to XVI. Some females attained sexual maturity at age VII, but only 50% were mature at age XIV. Less than 10% of the females 437 to 489 mm total length were mature; all females over 593 mm were mature. (Auth.)

17557. Latta, W. C. 1973. THE EFFECTS OF A FLIES-ONLY FISHING REGULATION UPON TROUT IN THE PIGEON RIVER, OTSEGO COUNTY, MICHIGAN. Mich. Dept. of Nat. Res., Fish. Res. Report No. 1807, 28 p.

The effects of a flies-only fishing regulation on the catch and standing crop of brook (Salvelinus fontinalis) and brown (Salmo trutta) trout were measured in experimental sections C and D (2.3 miles) of the Pigeon River in 1958-64. During these years the minimum legal size was 9 inches total length and the creel limit was 5 trout. For the years 1951-57, before the flies-only regulation, any lure was permitted, and the creel limit was 2 trout in 1951-54 and 5 trout in 1955-57. The size limit was also 9 inches throughout the period 1951-57. Because of environmental variability, a ratio was used to relate experimental sections C and D to control section B, the river section immediately downstream. In Section B (1.2 miles in length) the regulations were a minimum length of 7 inches, a creel limit of 5 trout, and no restriction as to lure used for the test years 1951-64. Of the various aspects of the catch and standing crop analyzed, only the catch of brook trout (in numbers and pounds) and the number of young-of-the-year brook trout were statistically significant. None of the brown trout parameters was significant. For the brook trout, fewer fish were caught during the years of flies-only, 1958-64, than during the before years, 1955-57 (or the combined years, 1951-57), probably as a result of the decreased fishing pressure. The young trout were fewer in number during the years of flies-only, 1958-64, and during the years 1951-54 (under a 2-trout limit, any lure), than during the years 1955-57 (under a 5-trout limit, any lure); there is no obvious explanation. Fishing pressure in hours in Section C and D declined 44% under the flies-only regulation from 1955-57 to 1958-64. The slight increase in the catch per hour per trip, from 0.06 to 0.07 trout, was not statistically significant. The increase in the creel limit from 2 trout to 5 did not increase the total catch nor significantly decrease the percentage of successful anglers. (Auth.)

17558. Machiewicz, John S. (Dept. of Biol., State Univ. of N. Y. at Albany, Albany, New York). 1974. Isoglaridacris calentineri n. sp. (CESTOIDEA: CARYOPHYLLIDEA) FROM CATOSTOMID FISH IN WESTERN UNITED STATES. Trans. Amer. Microsc. Soc., 93(1): 143-147.

The new species is described from Catostomus columbianus and C. macrocheilus in the Snake River drainage of Idaho. It is the second species in the genus generally lacking postovarian vitellaria. A discussion of pertinent morphological features, intraspecific variation, and comparisons with related species follows the description. A key to the six species in the genus is presented. (Auth.)

17559. Zakhidov, M. T. (Inst. of Zool. and Parasitol., Uzbek Acad. of Sci., Tashkent, USSR). 1973. MERMITHIDS - PARASITES OF SOME ORGANISMS THAT SERVE AS FODDER FOR FISH. Hydrobiological Journal, 9(1): 57-60.

The study of mermithids (Mermithidae) is now of considerable urgency because these worms markedly reduce the abundance of chironomids which constitute a substantial part (70 to 80%) of the benthos biomass and in many lakes serve as a principal food for fish. Data are presented on the biology of entomonematodes.

17560. Graynoth, E., and W. Skrzynski (Fish. Mgmt Div., Min. of Agric. and Fish., Wellington, New Zealand). 1973. THE WAITAKI VALLEY TROUT AND SALMON FISHERY. N. Z. Min. of Agric. and Fish., Fish. Tech. Report No. 100, 36 p.

This report describes the trout and salmon fisheries of the Waitaki Valley Acclimatisation District. It is based on the angling results collected from 1957 to 1967 by three angling diary schemes. Angling is rapidly becoming more popular in this district, probably because of the increase in hydro waters which are easy and simple to fish. The average Men's Whole Season License holder fishes for about 13 days per season to catch about 10 fish. Because of the increase in license sales, it is calculated that the total district crop of fish has increased from 19,000 fish in 1957 to as many as 45,000 fish per season in 1967. This is one of the largest increases in crop shown in any Acclimatisation District. The total district angling effort is about 75,000 days per season. Brown trout are the principal species caught but considerable numbers of rainbow trout are caught mainly in Lake Benmore and Lake Aviemore and quinnat salmon are caught in the lower Waitaki River. The trout caught are large. The main historical changes in species composition and fish sizes occur in the new hydro lakes. In other waters the species composition and size of fish have remained stable. There is little or no information on the density of the natural stocks of trout and salmon in these waters; it is hoped that this situation will be rectified in the near future. Eleven major waters and anglers' catches are described. The fisheries regulations are very lenient and the Acclimatisation Society is active in promoting and protecting the fishery. (Authors' summ.)

17561. Snow, J. R. (Marion Natl. Fish Hatchery, Marion, Alabama 36756). 1973. CONTROLLED CULTURE OF LARGEMOUTH BASS FRY. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 392-398.

A method for the controlled production of largemouth bass, Micropterus salmoides, Lac. fry is described. The method was based upon use of artificially-fed brood fish which were stocked into small earthen ponds equipped with nylon felt spawning mats. Eggs deposited on the mats were separated, cleaned and incubated in a Heath Vertical Incubator. Fry hatched in one to two days and were held until swimup in holding troughs or shipped during the yolk sac absorption stage. A trial of the technique in 1972 resulted in approximately 2,714,000 eggs being collected from 563 fish stocked in seven 0.1-acre ponds. From these eggs, 1,564,000 fry were hatched and survived (57.6 percent) to swimup or for shipment as sac fry. Twenty-two percent of the eggs collected were infertile according to examination of samples removed during processing. Subtracting this percentage from the total number of eggs collected gives an estimated 2,117,000 which could have hatched. Usable fry production was 1,564,000 or 73.9 percent of the viable eggs incubated. Five age classes of adults were included in the stocking. Best egg production was from five-year-old females, with an average of 2.0 spawns each, followed by two-year-olds with 1.9 spawns each. Three-, four- and one-year age classes produced 1.3, 0.9 and 0.8 spawns respectively per female stocked. The advantages and disadvantages of the method are discussed along with some possible applications. (Auth.)

17562. Falk, M. R., M. D. Miller, and S. J. M. Kostiuk (Resource Mgmt Branch, Fish. Operations Directorate, Central Region, Winnipeg, Manitoba, Canada). 1973. BIOLOGICAL EFFECTS OF MINING WASTES IN THE NORTHWEST TERRITORIES. Environ. Canada, Tech. Report Series No. CEN/T-73-10, 89 p.

17563. Shubart, Bonnie J., and Ted S. Y. Koo (Nat. Res. Inst., Univ. of Maryland, Chesapeake Biol. Lab., Solomons, Maryland 20688). 1973. SEX DIFFERENTIATION IN JUVENILE STRIPED BASS, Morone saxatilis. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 122-124.

Morone saxatilis, the striped bass, has no external features by which one can distinguish males from females; only when the adult fish are running ripe are there differences in body shape. Sex determination, therefore, usually depends on gonad examination by histological techniques, autopsy, or biopsy. The first method is time-consuming and the latter two fail in juvenile fish. Also, the young striped bass goes through a period of sex indifference before its gonads differentiate into ovaries or testes. The aims of our work were to determine: (1) at what size and age the gonads of the striped bass differentiate, and (2) a fast, yet accurate, method of determining the sex of the juveniles. Examination with the naked eye of the gonads of juvenile fish yields no differences between indifferent, male, and female gonads. When the gonad is placed under a dissecting microscope, a very subtle difference can be seen between ovaries and testes. The surface of the ovary shows a faint granularity, while the surface of the testis is smooth. In the most recent differentiated gonads, however, these differences are extremely difficult to detect. More accurate is the examination of smears of juvenile gonads. Smears without stain give nearly as good resolution as those treated with methylene blue. The smear of the ovary shows a prominent granularity, each rather large granule representing an egg follicle. The testis has a much finer granularity. The smear of the indifferent gonad is very smooth and structureless and is not easily distinguished from that of an immature testis. We prepared and examined microscopically histological sections of the gonads of 65 striped bass ranging in fork length (FL) from 7.8 to 22.5 cm to determine sex differentiation. We found initial differentiation of the gonads to occur in fish between 13 and 15 cm (FL). From the results of scale and length-frequency studies, we conclude that the gonads differentiate sometime between winter of the first year and summer of the second year of growth. There appears to be no difference between males and females as to size or age at which gonadal differentiation occurs. Therefore, in fish greater than 15 cm (FL), or more than 1 year old, it is very likely that gonad differentiation has occurred, and examination of smears of gonadal tissue is a fast and accurate method of sex determination. (Authors)

17564. Chambers, Howard, and David L. Fabacher (Dept. of Entomol., Miss. State Univ., Mississippi State, Mississippi 39762). 1973. MIDGE LARVAE CONTROL IN COMMERCIAL CATFISH PONDS: TOXICITY OF ABATE(R) TO CHANNEL CATFISH (Ictalurus punctatus). Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 399-401.

Populations of midges are a general nuisance around commercial catfish ponds in the Mississippi Delta. Abate(R) [(0, 0, 0', 0'-tetramethyl 0, 0'-thiodi-p-phenylene phosphorothioate) American Cyanamid Company] is recommended for midge larvae control in aquatic areas at a concentration of about 2 ppb. Data in this study show that the LC50 of Abate to channel catfish is between 5 and 7 ppm. This represents a wide safety margin that should insure Abate to be non-toxic to channel catfish when used at the recommended rate for midge larvae control. (Authors)

17565. Morgan, W. S. G., and P. C. Kühn (Nat. Inst. for Water Res., South African Council for Sci. and Ind. Res., Pretoria, South Africa). 1974. A METHOD TO MONITOR THE EFFECTS OF TOXICANTS UPON BREATHING RATE OF LARGEMOUTH BASS (Micropterus salmoides Lacépède). Water Research, 8(1): 67-77.

An apparatus was designed to measure continuously the effects of nominal concentrations of copper, cadmium, phenol, ammonia and cyanide upon breathing rates in largemouth bass. Acute and sublethal toxic effects were indicated in a majority of cases by increased breathing rate. The use of this reaction and the monitoring apparatus to monitor a wide range of industrial pollutants was shown to be practicable. Consideration is also given to its possible application in local situations. (Authors)

17566. Crouch, Dennis E., William T. Yasutake, and Robert R. Rucker (Western Fish Dis. Lab., Sand Point NSA, Seattle, Washington 98115). 1973. OPEN-JAW SYNDROME IN CHINOOK SALMON (Oncorhynchus tshawytscha) AT A HATCHERY. J. Fish. Res. Board Can., 30(12): 1890-1892.

Nearly 0.5% of the yearling spring chinook salmon (Oncorhynchus tshawytscha) at a national fish hatchery were observed with mouth agape, the condition occurring in two of 16 ponds. X-radiographs and histological preparations indicated that the articular bone of the lower jaw was malformed and dislocated dorsal and posterior to its normal point of attachment. The bone appeared to be embedded in the mandibular muscle and surrounded by an extensive fibrous tissue network. Genetic aberration, environmental interaction, and teratogenic substances are discussed as possible causes of the anomaly. (Authors)

17567. Petit, Gedeon D., III (Tenn. Game and Fish Comm., P. O. Box 40747, Nashville, Tennessee 37220). 1973. STAKE BEDS AS CRAPPIE CONCENTRATORS. Proc. of 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 401-406.

In 1968 fisheries personnel of the Tennessee Game and Fish Commission began constructing and evaluating stake beds made of sawmill strips as tools to help fishermen harvest more crappie from Kentucky Reservoir. They are: hammer driven type; driver driven type; portable pre-fab type. Crappie concentrate readily on all three types with variations occurring due to location and seasonal fish movement. Over 128 hours of documented fishing on stake beds by the author produced 6.6 crappie per hour as opposed to 1.8 crappie per hour on control cover areas. A five year mean for crappie fishermen on the same reservoir is 0.998 crappie per hour. (Auth.)

17568. Graynoth, E., and W. Skrzynski (Fish. Mgmt. Div., Min. of Agric. and Fish., Wellington, New Zealand). 1973. THE MARLBOROUGH TROUT FISHERY. N. Z. Min. of Agric. and Fish., Fish. Tech. Report No. 103, 27 p.

This report describes the trout fisheries of Marlborough Acclimatisation District. It is based on angling results collected since 1949 by six angling diary schemes. Angling has increased in popularity in recent years but license sales remain low. The average Men's Whole Season License Holder fishes for about 13 days to catch about 8 fish per annum, the total district catch of about 4,700 trout being caught in just under 9,000 days. The majority of fish caught are brown trout, although a few rainbow trout are caught in the Pelorus system. The trout are large and the average size has not deteriorated for many years. Trout densities have not been assessed but it is thought that the anglers in some areas catch quite a high percentage of the stock. There appears to be a depreciation in the fishery of Spring Creek. The seven principal waters and anglers' catches are described. The fisheries regulations have little restrictive effect and fisheries management can be improved by further scientific surveys of the waters. (Authors)

17569. Stacey, N. E., and N. R. Liley (Dept. of Zool., Univ. of British Columbia, Vancouver, Brit. Columbia, Canada). 1974. REGULATION OF SPAWNING BEHAVIOR IN THE FEMALE GOLDFISH. Nature, 247(5435): 71-72.

It is suggested that under natural conditions female goldfish have an extended breeding season during which they may ovulate and spawn several times during a period of weeks. An important role of oestrogen seems to be to induce and maintain responsiveness to the stimulus of ovulated eggs; there is no indication whether oestrogen acts peripherally or centrally, or both. The fact that readiness to perform oviposition behavior in response to male courtship is induced by egg injection up to a month after the last ovulation indicates that the female goldfish is in an endocrine state appropriate for breeding for an extended period, but that spawning is normally synchronised with ovulation by the stimulus of a large intra-ovarian mass of ovulated eggs, which acts as a fine control in the timing of sexual responsiveness.

17570. Ricker, W. E. (Fish. Res. Board Can., Pacific Biol. Sta., Nanaimo, B. C., Canada). 1973. RUSSIAN-ENGLISH DICTIONARY FOR STUDENTS OF FISHERIES AND AQUATIC BIOLOGY. Fish. Res. Board Can. Bull. 183, 428 p., clothbound, $7.00 per copy.

17571. Cooper, Jon C., and Arthur D. Hasler (Lab. of Limnol., Univ. of Wisconsin, Madison, Wisconsin). 1974. ELECTROENCEPHALOGRAPHIC EVIDENCE FOR RETENTION OF OLFACTORY CUES IN HOMING COHO SALMON. Science, 183(4122): 336-338.

Differences were observed in the magnitude of the evoked electroencephalographic response to 1 percent morpholine for homing coho salmon (Oncorhynchus kisutch) exposed to morpholine as fingerlings 1 month before smolting as compared to salmon not exposed to morpholine as fingerlings. These results indicate that olfactory information has been retained for 18 months, the period between smolting and the homeward migration. (Authors)

17572. Whiteside, B. G., and Neil E. Carter (Biol. Dept., Southwest Texas State Univ., San Marcos, Texas 78666). 1973. STANDING CROP OF FISHES AS AN ESTIMATE OF FISH PRODUCTION IN SMALL BODIES OF WATER. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 414-417.

Sampling of fish for the purpose of estimating standing crop, annual net production, and the degree of relationship between these two variables was carried out in four Oklahoma farm ponds in 1965. Fish populations were assumed to be at or near the upper asymptotic level, and fishing was almost nonexistent. Annual rate of turnover varied less from one population to another than did standing crop. Turnover rates for most species appeared high, but this may be the normal situation in older ponds whose fish populations are not being harvested. Bartlett's three-group method for Model II regression was used to obtain the prediction equation: annual net production = 0.3465 + 0.6088 (standing crop). This equation showed by its positive slope that annual net production increased as standing crop increased. The coefficient of determination, $r^2 = 0.92$, indicated a strong relationship between standing crop and the annual net production of fishes. (Authors)

17573. van Coillie, R., and A. Rousseau (Inst. national de la recherche scientifique Univ. du Quebec, Ste Foy, Quebec, Canada). 1974. MINERAL COMPOSITION OF THE SCALES OF Catostomus commersoni FROM TWO DIFFERENT ENVIRONMENTS: STUDY BY ANALYTICAL ELECTRON MICROSCOPY. (Composition minérale des écailles du Catostomus commersoni issu de deux milieux différents: étude par microscopie électronique analytique). J. Fish. Res. Board Can., 31(1): 63-66.

The mineral content of scales, metals only, was studied. Fish of the Catostomus commersoni subspecies were used, taken from a healthy environment (the Manicouagan River) and an environment polluted by, among other substances, various metals (Rivière des Prairies, Near Montréal). X-ray microspectrometry was combined with electron microprobe scanning techniques, with subsequent microdensitometric scanning. Scales contained, in addition to the highly predominant calcium, the following: Na, Mg, Al, K, Fe, Cu, Zn, and Ba, as well as some Cr, Mn, Co, Ni, Sr, Ag, Cd, Cs, Hg, and Pb. All metals were between the circuli in the osteoid structures. The latter category of metals, widely known for their toxicity, were more abundant in the scales of the sample from polluted waters, whereas the reverse was true for the other metals, with the exception of Al and Ba, which were found in equal quantities in both samples. If the difference in content of the scales taken from fish of the two different environments is seen in relation with the fact that the toxic metals are more abundant in polluted waters and the fact that there is the possibility that excess metal from the water can replace calcium in the scales, we may infer that the mineral content of scales is related at least in part to that of the surrounding aquatic environment. (Authors)

17574. Bootsma, R. (Dept. of Spec. Animal Pathol., Fac. of Vet. Medicine, Univ. of Utrecht, 172 Biltstraat, Utrecht, the Netherlands). 1974. BACTERIAL GILL DISEASE OF CARP (Cyprinus carpio L.). Tijdschr. Diergeneesk., 99(2): 143-144.

In the Netherlands, bacterial gill disease of carp was observed for the first time in 1970. The role of myxobacteria in another disease of carp, gill necrosis, should be evaluated. (Auth.'s summ.)

17575. Koo, Ted S. Y., and Douglas E. Ritchie, Jr. (Nat. Res. Inst., Chesapeake Biol. Lab., Univ. of Maryland, Solomons, Maryland 20688). 1973. GROWTH OF JUVENILE STRIPED BASS, Morone saxatilis, AS DETERMINED BY TAGGING AND RECAPTURE. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ., No. 1, pp. 124-125.

Much of our present knowledge on the growth of striped bass (Morone saxatilis) has been obtained by indirect methods, such as length-frequency studies and scale-back calculations. This paper presents findings on monthly growth rates based on tagging experiments. We conducted one experiment in a laboratory aquarium where we reared both tagged and nontagged juvenile striped bass in their second year of life, averaging 176 mm fork length (FL), from September to June. By continuously recording water temperature and measuring and scale sampling fish at approximately monthly invervals, calculated monthly growth rates were: October, 8.8%; November, 3.8%; December through April, 0%; May, 4.6%; and June, 9.1%; we lacked data for July, August, and September. From September to June, the striped bass grew from a mean length of 176 mm to 227 mm, a gain of 29%. This growth related to water temperature. When temperature dropped below about 10.0°C, fish stopped feeding and growth stopped. Growth rate reached a maximum when water temperature rose above 20.0°C. Field tagging experiments were conducted in Patuxent River and upper Chesapeake Bay from 1966 to June 1968. Most of the striped bass tagged belonged to the 1966 year-class. We analyzed for growth a total of 395 recaptures which provided valid length information. All tagged bass at large during the months of November through April showed virtually no gain in length. For the other months, because the number of recaptures is small, it is not possible to calculate precise monthly growth rates. Data indicate, however, that the most rapid growth occurred in July, followed by August, June, September, May and October. From length-frequencies of striped bass of the same year-class which were sampled in 2 consecutive years, we estimate that juvenile striped bass gain a total of 74% in length from their first summer to their second summer of life. Based on our experiment, about 30% of the growth occurs during the months of May, June, October, and November. Since no increase in length occurs in the period from December through April, we estimate about 44% gain in length occurs in the months of July, August, and September. (Authors)

17576. Ebert, Earl E., Arthur W. Haseltine, and Randolph O. Kelly. 1974. SEA-WATER SYSTEM DESIGN AND OPERATIONS OF THE MARINE CULTURE LABORATORY, GRANITE CANYON. Calif. Fish and Game, 60(1): 4-14.

A marine culture laboratory, incorporating a dual sea-water intake and delivery system, was developed on the central California coast south of Monterey. The sea-water system is continuous flow design, includes a 94,625 liter (25,000 gal) storage capacity, and provides for filtered, heated, chilled, ultraviolet sterilized and raw (unaltered) sea-water. The submersible intake collector was especially designed to withstand strong surf conditions at the open-coastal laboratory location. Operations of the laboratory are described and major equipment items, and systems are discussed in detail.

17577. Echelle, Anthony A., John R. Schenck, and Loren G. Hill (Univ. of Okla. Biol. Sta., Kingston, Oklahoma). 1974. Etheostoma spectabile - E. radiosum HYBRIDIZATION IN BLUE RIVER, OKLAHOMA. Amer. Midl. Nat., 91(1): 182-194.

Putative hybrids occur at nearly every locality where Etheostoma spectabile and E. radiosum are found together in Blue River. Evidence suggestive of introgression of spectabile by radiosum is more extensive in the river channel than in springs tributory to the river, but the entire spectabile population seems to be introgressed. At certain localities the radiosum population is shifted, morphologically, toward spectabile. This is most extensive in springs where spectabile is by far the more abundant species. In one small spring, however, a small population of intermediate individuals occurred in the absence of spectabile; this might be used to argue that radiosum is introgressed, but other explanations are not excluded. The present situation in Blue River may be due to some historical event, such as asynchronous colonization, that caused an increase in hydridization potential. (Authors)

17578. Migalovskiy, I. P. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Inst. Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. DEVELOPMENT OF FISH EGGS AND THE EARLY PERIOD OF GAMETOGENESIS IN THE EMBRYOS AND LARVAE OF THE ATLANTIC SALMON UNDER CONDITIONS OF RADIOACTIVE CONTAMINATION OF WATER. Trans. from Trudy Polyar Nauch. Issled 1971, pp. 36-52, AEC Translation 7418; Selected Water Resources Abstracts, 7(4): p. 62, 1974.

Three activity levels of Sr90 + Y90 were used: 2.10 to the minus 5th power, 0.7.10 to the minus 6th power and 0.6.10 to the minus 7th power curie/liter. Stages in development of eggs of the Atlantic salmon prior to closing of the blastopore, formation of the 'tail kidney', yolk-vitelline circulation and one-day larvae were examined. There was no difference between the control and experimental variants with respect to duration of individual development stages and the length of embryos and larvae. In addition, at the mentioned development times, the number of primary sex cells (PSC) in control and experimental variants were computed. There was a depression in the process of formation of PSC for the experimental variant with an activity of 2.10 to the minus 5th power curie/liter, whereas the number of PBC in the experimental variant with an activity of 0.7.10 to the minus 6th power curie/liter approaches their number in the control and in the variant with 0.6.10 to the minus 7th power curie/liter the number somewhat exceeds the control.

17579. Wilbur, Robert L., and Richard M. Duchrow (Eustis Fish. Res. Lab., Eustis, Florida 32726). 1973. DIFFERENTIAL RETENTION OF FIVE FLOY TAGS ON LARGEMOUTH BASS (Micropterus salmoides) IN HATCHERY PONDS. Proc. of 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 407-413.

Floy dart tag (FD-67 international orange) loss of 78% was discovered among largemouth bass held in hatchery ponds for three months. Separation of the No. 20 tubing from its monofilament anchor accounted for 81% of the losses, while dislodgement of the anchor from fish occurred in only 19% of the losses. Since ponds were free of vegetation which could entangle the tag and contained only tagged bass and bait fish, tag loss was sssumed to be the result of bass pulling tags from each others' backs. To test this theory and determine differential retention for other types of Floy dart tags, further studies were conducted. International orange, green, and brown FD-67 tags sustained 58%, 62%, and 63% retention, respectively, on largemouth bass held in a hatchery pond for 3 months. Differences in retention were nonsignificant in Chi-square testing. In another pond, three international orange tag types were compared: (1) FD-67 (Standard), (2) FD-67C (No. 20 tubing only half as long), and (3) FD-68B (reinforced attachment of tag and anchor). Percent retention was 47%, 75%, and 88% for the short, standard, and reinforced tags, respectively. Chi-square tests indicated that retention was significantly lower for the short tag than for the reinforced and standard tags. Data indicated, however, that this difference was probably caused by manufacturer's quality control rather than difference in tag design. Reinforced and standard tag retention did not differ significantly. Separation of the No. 20 tubing from its anchor accounted for 23% to 75% of the tag losses in the above experiments. (Authors)

17580. Wright, John C., and Raymond A. Soltero (Montana State Univ., Bozeman, Montana). 1973. LIMNOLOGY OF YELLOWTAIL RESERVOIR AND THE BIGHORN RIVER. EPA, Ecolog. Research Series EPA-R3-73-002, 106 p.; Univ. of Wisconsin, Eutrophication, No. 38, p. 7, No. 5098, 1973.

A comprehensive investigation of physical, chemical and biological limnology of Bighorn Lake (formerly Yellowtail Reservoir) and its tributaries was initiated in 1967 to determine if a decline in primary productivity of this new impoundment would occur. The research encompassed heat budget, salinity regime, internal currents, and biological productivity (phytoplankton).

17581. Robison, Henry W. (Dept. of Biol. Sci., Southern State Coll., Magnolia, Arkansas). 1974. FIRST RECORD OF THE ICTALURID CATFISH, Noturus phaeus, FROM ARKANSAS. Southwest. Nat., 18(4): 475.

17582. Van Velson, Rodney C. (Nebr. Game and Parks Comm., Alliance, Nebraska, 69301). 1974. SELF-SUSTAINING RAINBOW TROUT (Salmo gairdneri) POPULATION IN McCONAUGHY RESERVOIR, NEBRASKA. Trans. Amer. Fish. Soc., 103(1): 59-64.

A self-sustaining rainbow trout population has developed in the North Platte River drainage. This population inhabits McConaughy Reservoir and reproduces successfully in tributary streams of the North Platte River located approximately 113 to 145 km above the reservoir. Fall and spring spawning populations migrate from the reservoir. Scale analysis indicated 92% of the juveniles had spent 1 yr and 8% had spent 2 yr in the stream before the spring migration to the reservoir as 175-250 mm smolts. In the 1965-1969 spawning populations 13 life history categories were present. The spawning runs were composed of 76% maiden spawners, 22% second-year spawners and 2% third-year spawners. The sex ratio of the spawning runs ranged between 2.0-2.2 females per male. The rainbow trout population is subjected to a variety of conditions in tributary streams of the North Platte during summer including flooding, irrigation return water and high water temperatures. However, spawning rainbow trout utilize these groundwater streams from November through April. In addition the coldwater habitat in the reservoir is restricted throughout the summer, especially during August. The established rainbow trout population survived better in this environment than hatchery rainbow trout. (Auth.)

17583. Kolehmainen, Seppo E. (Ecolog. Sciences Div., Oak Ridge Natl. Lab., Oak Ridge, Tennessee). 1974. DAILY FEEDING RATES OF BLUEGILL (Lepomis macrochirus) DETERMINED BY A REFINED RADIOISOTOPE METHOD. J. Fish. Res. Board Can., 31(1): 67-74.

The daily values of ^{137}Cs intake by bluegill (Lepomis macrochirus) from a small impoundment receiving low-level radioactive effluents were used to calculate the daily feeding rates of the fish. The calculations of ^{137}Cs intake, for a nonequilibrium state, were based on fish growth, the seasonal fluctuation of ^{137}Cs concentration in fish, and the temperature-elimination rate relationship. The feeding rates were obtained by dividing the daily intake of ^{137}Cs by the concentration of ^{137}Cs in the diet. The daily meal of bluegill varied from 0.8% of body weight in February to 3.2% in June with an annual mean of 1.75%. There was a positive correlation ($r^2 = 0.805$) between the daily meal and the daily temperature. The ecological growth efficiency was 4.2% during the period from April to October. (Auth.)

17584. Champ, Michael A., Frank S. Davis, and J. R. Wayland (Texas A&M Univ., College Station, Texas 77843). 1973. ULTRAHIGH-FREQUENCY ELECTROMAGNETIC RADIATION UTILIZED FOR AQUATIC VEGETATION CONTROL. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 418-420.

An ultrahigh-frequency electromagnetic field (2,450 $\pm$ 20 megahertz) is lethal to floating aquatic plants. Preliminary experiments indicate specie sensitivity varies within the duckweeds. Laboratory experiments indicate their Median Tolerance Limit is approximately 16.7 joules/ml, for our experimental conditions. However, field simulated experiments with soil banked test containers indicate higher energy levels will be necessary for field control. (Authors)

17585. Cole, Charles F. (Dept. of Forestry and Wildl. Mgmt., Holdsworth Hall, Univ. of Mass., Amherst, Massachusetts 01002). 1973. CAN MORTALITY RATES BE DETERMINED FOR ESTUARINE ICHTHYOPLANKTON POPULATIONS? Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 163-172.

This study concentrated on the early life history of the winter flounder, Pseudopleuronectes americanus (Walbaum), in the Weweantic River estuary in Massachusetts, using samples drawn from 1965 to 1968. Comparisons are made with a similar study in the Mystic River, Connecticut. Sampling problems and interpretation of variation for estimating year-class strength, larval mortality rates, and the related estuarine environmental factors are discussed. (Auth.)

17586. Johnston, I. A., and G. Goldspink (Muscle Res. Lab., Dept. of Zool., Univ. of Hull, Hull, England). 1973. QUANTITATIVE STUDIES OF MUSCLE GLYCOGEN UTILIZATION DURING SUSTAINED SWIMMING IN CRUCIAN CARP (Carassius carassius L.). J. Exp. Biol., 59(3): 607-615.

The relationship between the wet weight of superficial red muscle and the wet weight of the remaining trunk musculature was found to have the form $y = 0.036 X + 0.339$. The average weight of superficial red muscle accounted for 7.4% of the myotomal mass. A technique is described which allows quantitative studies to be made on glycogen utilization in these muscles for short periods of swimming. A total of 120 Crucian carp (Carassius carassius L.) were studied at six different swimming speeds ranging from 2.0-4.2 bodylengths/s. The $\log_{10}$ of the total glycogen utilization of the superficial red muscle was found to be linearly related to swimming speed. Statistically significant glycogen utilization from the remaining myotomal musculature only occurred at speeds in excess of around 3 bodylengths/s. At these speeds the superficial red muscle only accounted for 15-20% of the total glycogen mobilized by the swimming musclature. The significance of these results is discussed in relation to the division of labour between the myotomal muscles of fish. (Authors' summ.)

17587. Smith, R. J. F., and B. D. Murphy (Dept. of Biol., Univ. of Saskatchewan, Saskatoon, Saskatchewan, Canada). 1974. FUNCTIONAL MORPHOLOGY OF THE DORSAL PAD IN FATHEAD MINNOWS (Pimephales promelas Rafinesque). Trans. Amer. Fish. Soc., 103(1): 65-72.

Breeding male fathead minnows (Pimephales promelas) develop a dorsal pad as well as several other secondary sexual characteristics. The dorsal pad consists of a dermal layer made up of loose connective tissue which develops above the scales, and an epidermal layer of stratified epithelium. The outer layer of the epidermis contains many mucus cells. Mucus secreted by this layer is deposited on the spawning surface during contact movements performed by breeding males. Taste buds are present in the epidermal layer of the dorsal pad and other regions. Contact movements by breeding males may facilitate chemosensory sampling of the spawning site and eggs. (Authors)

17588. Summerfelt, Robert C., and Paul R. Turner (Okla. Coop. Fish. Unit, Okla. State Univ., Stillwater, Oklahoma 74074). 1973. RATE OF LOSS OF RING AND SPAGHETTI TAGS ON FLATHEAD CATFISH, Pylodictis olivaris (Rafinesque). Proc. of 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 421-427.

During 1968-1971 a total of 494 flathead catfish were tagged with ring and/or spaghetti tags. Of 175 recaptures, 111 were by the authors and 64 were by fishermen. Application of ring tags to the pectoral spine and spaghetti (T-bar, anchor type) tags to the operculum is described. The anchor tags were applied to the operculum by piercing the bone with the needle of the tag applicator. Ring tags of monel metal were held totally by encirclement of the base of the pectoral spine. Rates of tag loss were measured from fish marked and recaptured March 1968 through October 1971. For both tag types, the rate of tag loss was linear the first year, but exponential the second year after tagging. A discontinuous linear regression, separating the first and second years was used to calculate tag loss. The rate of tag loss the first year was 0.0665%/day for ring tags and 0.0830%/day for spaghetti tags; the second year, the rates were 0.1230% and 0.0895%/day for ring and spaghetti tags respectively. Loss of ring tags was much higher the second year compared with the first year. Using both tags on each fish would give low probability for complete loss of identity (P = .6% in 100 days, = 2.0% in one year). One fish, tagged with both tag types, was recaptured with both tags still firmly attached 1410 days (3.86 years) after tagging. Maximum tag retention times have been 1531 days (4.19 years) for a ring tag and 1448 days for a spaghetti tag. (Authors)

17589. McLeay, D. J. (Dept. of Zool., Univ. of Br. Columbia, Vancouver, Br. Columbia, Canada). 1973. EFFECTS OF CORTISOL AND DEXAMETHASONE ON THE PITUITARY-INTERRENAL AXIS AND ABUNDANCE OF WHITE BLOOD CELL TYPES IN JUVENILE COHO SALMON, Oncorhynchus kisutch. Gen. Comp. Endocrinol., 21(3): 441-450.

17590. Beamish, Richard J. (Dept. of the Environ., Freshwater Inst., Winnipeg, Manitoba, Canada). 1974. LOSS OF FISH POPULATIONS FROM UNEXPLOITED REMOTE LAKES IN ONTARIO, CANADA AS A CONSEQUENCE OF ATMOSPHERIC FALLOUT OF ACID. Water Research, 8(1): 85-95.

Fish populations in the study lakes were disappearing, primarily as a result of the high acid content of the lakes. As a lake became acidic, the more acid sensitive species ceased reproduction and eventually disappeared. The loss of fish populations resulted both from a long-term lethal effect and from an absence of recruitment of young into the population due to the failure of reproduction. In one of the lakes the acid levels have been high long enough to cause the loss of populations of even the most resistant species. The anomalous concentrations of nickel in the lakes and precipitation; the high concentrations of nickel emitted into the atmosphere in Sudbury, Ontario; the ability of sulfur dioxide to form acid in the atmosphere and fallout in the precipitation over considerable distances from the emission source; the tremendous quantities of sulfur dioxide emitted by industry in Sudbury; the abnormally high concentrations of hydrogen and sulfate ions in the study lakes; all indicated that the emissions from the nickel smelters near Sudbury were the most probable source of contamination that has resulted in the loss of fish stocks from O.S.A., Muriel, and other lakes. (Auth.)

17591. Ritchie, Douglas E., Jr., and Ted S. Y. Koo (Nat. Res. Inst., Univ. of Maryland, Chesapeake Biol. Lab., Solomons, Maryland 20688). 1973. MOVEMENTS OF JUVENILE STRIPED BASS IN THE ESTUARY AS DETERMINED BY TAGGING AND RECAPTURE. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 126-128.

Beginning in July 1966 and nearly monthly for 9 months following, we applied a total of 3,102 green Carlin tags to juvenile striped bass in the Patuxent River, Maryland. From June 1967 to May 1968, we applied 4,404 tags in the upper Chesapeake Bay. The tagged fish consisted primarily of the 1966 year-class. By May 1968, we recovered 664 fish (21.4%) from the Patuxent tagging and 401 fish (9.1%) from the upper bay tagging. Patuxent tagging results can be summed up according to two major release sites. The first site was at the mouth of the river, where we tagged and released juvenile bass of hatch-of-the-year during July to October. All recaptures made in the same summer occurred in the same general area, indicating that these fish stayed in the shoal area for the entire summer. After October, however, these fish disappeared from the tagging site. No recaptures were made upriver to date, but three recaptures were made 5 to 16 months later from upper Chesapeake Bay about 50 or more miles away. The second release site was some 17 to 33 miles upriver. Here we tagged and released bass, mostly of the same year-class as above, in fall and winter. Recapture patterns indicated that within the same seasons juvenile bass moved up and down the same section of river, with some indication of a net upriver movement, extending into virtually freshwater areas as the season progressed. However, starting with the following summer and thereafter, recaptures have been made in the river, downriver, and out in upper bay, indicating a definite out-of-river migration. Recaptures also took place at the original release sites in the river after a time lapse of more than a year. It is not possible to say whether these fish stayed in the river all this time or moved out of the river and returned. Upper bay tagging, started in June 1967, also involved mainly 1966 year-class of fish. Most of the recaptures to date were confined to the same general area of release; they became more widespread toward fall and winter and some fish were recaptured during winter in the freshwater areas at the extreme upper reaches near the Maryland entrance of the Chesapeake and Delaware Canal. Five recaptures have been made in lower Delaware Bay, indicating a definite through-the-canal movement by these young striped bass. (Authors)

17592. Lenarz, W. H., F. J. Mather III, J. S. Beckett, A. C. Jones, and J. M. Mason, Jr. (Southwest Fish. Center, Natl. Marine Fish. Serv., NOAA, La Jolla, California 92037). 1973. ESTIMATION OF RATES OF TAG SHEDDING BY NORTHWEST ATLANTIC BLUEFIN TUNA. NOAA Fish. Bull., 71(4): 1103-1105.

17593. Bullock, G. L., H. M. Stuckey, Diane Collis, R. L. Herman, and G. Maestrone (Eastern Fish Dis. Lab., Kearneysville, West Virginia 25430). 1974. IN VITRO AND IN VIVO EFFICACY OF A POTENTIATED SULFONAMIDE IN CONTROL OF FURUNCULOSIS IN SALMONIDS. J. Fish. Res. Board Can., 31(1): 75-82.

In vitro and in vivo efficacy of a potentiated sulfonamide, Ro5-0037, for inhibition of Aeromonas salmonicida, causative agent of fish furunculosis was determined. The components of the potentiated sulfonamide, sulfadimethoxine, and ormetoprim were tested alone and in combination. In vitro results showed that both sulfonamide-resistant and sensitive strains of A. salmonicida had greater sensitivity to Ro5-0037 than to either of its components. Also, sulfonamide-sensitive strains developed resistance to ormetoprim and sulfadimethoxine more rapidly than to Ro5-0037. Efficacy studies with small numbers of artificially infected trout revealed that Ro5-0037 effectively controlled furunculosis at 50 mg/kg of fish/day, one fourth the usual sulfonamide dosage level. Extensive field trials also showed the 50 mg/kg level of Ro5-0037 gave effective control of hatchery outbreaks of furunculosis. As found in the in vitro studies, all in vivo trials indicated the combination of ormetoprim and sulfadimethoxine was more efficient in inhibiting A. salmonicida than either component alone. (Authors)

17594. Surber, Eugene W. 1973. LEVELS OF PHOSPHORUS AND NITROGEN IN SHENANDOAH RIVER WATER. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 428-441.

In the period 1936-1941, smallmouth bass nests were counted in the Main Stem and South Fork of the Shenandoah River. Counts were made during the smallmouth bass spawning season when waters were clear, usually May 1-15. Due to eutrophication, the South Fork and Main Stem water now remains clear for only a few days. The enumeration and study of bass nests has been made more difficult due to the sudden development of blooms of algae. High levels of phosphorus and nitrogen in the South and North Forks and the Main Stem are believed to be the cause. Total phosphate ranged from 0.33 to 4.80 parts per million in the South Fork and from 0.23 to 1.50 ppm in the Main Stem. The highest seasonal averages occurred in the spring and fall. In the North Fork, total phosphate ranged from 0.14 to a maximum of 1.40 ppm, with the highest seasonal averages occurring in the spring and summer. Orthophosphate ranged from 0.30 to 2.30 ppm in the South Fork, and from 0.14 to 1.04 ppm in the Main Stem. The North Fork ranged from 0.07 to 1.15. The highest averages occurred in the fall when the South Fork averaged 0.934 ppm and the Main Stem 0.489 ppm. The highest average in the North Fork occurred in the Spring (0.453 ppm). Nitrate nitrogen levels were high in all sections of the river and based on past records is increasing steaily. In the South Fork, nitrate nitrogen as NO3 ranged from 1.18 to a maximum of 8.93 ppm. Spring and winter had the highest seasonal averages with 5.60 and 6.79; the Main Stem was from 0.82 to a maximum of 7.90 ppm. Spring and winter had the highest averages with 4.488 and 5.626 ppm, respectively. The North Fork had the highest nitrate nitrogen, with levels ranging from 1.087 to a maximum of 11.462 (an amount approaching safety limits for drinking water). Winter had the highest seasonal average, 7.584ppm. In both the South and North Forks, the average, as well as winter and summer average nitrate and phosphate levels, decreased from their initial high levels in passage downstream. Nitrite nitrogen levels and nitrogen/phosphorus ratios were also determined. (Auth.)

17595. Butler, Robert L., et al. (Dept. of Biol. and Coop. Fish. Unit, Pennsylvania State Univ., University Park, Pennsylvania 16802). 1973. FISH AND FOOD ORGANISMS IN ACID MINE WATERS OF PENNSYLVANIA. Environ. Protection Agency, Ecological Res. Series, EPA-R3-73-032, 159 p.; Univ. of Wisconsin Eutrophication, Issue No. 38, p. 10, No. 5108.

The cover response of fish in bioassay of acid water proved unsuitable for establishment of water quality criteria. Common fish species normally distributed over several watersheds were absent where there was severe acid mine drainage. The median tolerance limits to low pH levels of five aquatic insects were determined.

17596. Ellis, J., and S. Kanamori (Div. of Biol. and Chem. Sci., Wollongong Univ. Coll., Wollongong, Australia). 1973. AN EVALUATION OF THE MILLER METHOD FOR DISSOLVED OXYGEN ANALYSIS. Limnol. Oceanogr., 18(6): 1002-1005.

The Miller and Winkler methods for dissolved oxygen determination are compared over a range of salinities and oxygen levels. By performing the Miller titration using a capillary sidearm flask, atmospheric oxygen can be excluded and a precision of $\pm$ 0.05 mg O_2 liter^{-1} obtained. The Miller end point is highly dependent on pH and on the ratio of sodium hydroxide to sodium potassium tartrate, so that carefully standardized conditions must be used to obtain accurate and reproducible results. (Authors)

17597. Dovel, W. L., J. A. Mihursky, and A. J. McErlean (Nat. Res. Inst., Univ. of Maryland, Chesapeake Biol. Lab., Solomons, Maryland 20688). 1973. LIFE HISTORY ASPECTS OF THE HOGCHOKER, Trinectes maculatus, IN THE PATUXENT RIVER ESTUARY, MARYLAND. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 129-130.

This paper presents information on the abundance and distribution of life history stages of the hogchoker in the Patuxent River, Maryland. Egg collections indicate that the spawning area is located in the lower river in waters having salinities greater than 9.0 ‰. After hatching, the larvae move upstream and congregate in a low salinity nursery area close to the salt/freshwater interface where they remain during winter. During the first 4 years of life, maturing hogchokers follow two distinct movements: upstream toward the nursery area in fall, and downstream toward the spawning area in spring. As these fish mature, they increase their range of travel away from the nursery ground. We determined movements of fish following hatching by monitoring the large 1963 year-class, identified by using the polymodal length-frequency technique, and verified movements by regression analyses. Brief comments are made in relation to protecting the integrity of the entire estuary for completion of some life history cycles. (Authors)

17598. Mason, J. C. (Dept. of the Environ., Fish. and Marine Serv., Pacific Biol. Sta., Nanaimo, British Columbia, Canada). 1974. BEHAVIORAL ECOLOGY OF CHUM SALMON FRY (Oncorhynchus keta) IN A SMALL ESTUARY. J. Fish. Res. Board Can., 31(1): 83-92.

Chum salmon fry (Oncorhynchus keta) in the estuary of a small coastal stream exploited fresh water, estuarine, and marine food chains and, by so doing, were exposed to marked, daily fluctuations in salinity that demanded active selection of fresh water on ebbing tides day and night. The resulting delay in seaward migration and associated behavioral observations are inadequately reflected in published accounts of the life history and behavior of chum fry in natural systems and laboratory situations, and the downstream displacement theory. The biological basis for delayed seaward migration of chum fry merits the attention of fishery researchers and resource managers alike. (Auth.)

17599. Shapiro, Arthur M. (Dept. of Zool., Univ. of Calif., Davis, California). 1974. THE AGE AND GROWTH OF THE BLACKNOSE SHINER, Notropis heterolepis Eigenmann and Eigenmann. Amer. Midl. Nat., 91(1): 242-248.

The investigation of the age and growth of the blacknose shiner, Notropis heterolepis Eigenmann and Eigenmann, is based on 319 specimens collected in Hamburg Lake, Livingston Co., Michigan. Only 20 specimens were in Age Group I. The remainder were young-of-the-year. In its first year this species grew to 77% of the length attained by the autumn of its second year. (Auth.)

17600. Wellborn, Thomas L., Jr. (Miss. Coop. Ext. Serv., Mississippi State, Mississippi). 1973. PROPOSED GUIDELINES FOR STATES PLANNING FISH DISEASE CONTROL PROGRAMS. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 341-344.

17601. Smith, Roderick M., and Charles F. Cole (Dept. of Forestry & Wildlife Mgmt., Holdsworth Hall, Univ. of Mass., Amherst, Massachusetts 02112). 1973. EFFECTS OF EGG CONCENTRATIONS OF DDT AND DIELDRIN ON DEVELOPMENT IN WINTER FLOUNDER (Pseudopleuronectes americanus). J. Fish. Res. Board Can., 30(12): 1894-1898.

Abnormal gastrulation and a high incidence (mean = 39%) of vertebral deformities at hatching were encountered in developing eggs from winter flounder, Pseudopleuronectes americanus, experimentally exposed as adults to sublethal concentrations of DDT. Bone erosion and hemorrhaging at the vertebral junctures were often observed in conjunction with the vertebral deformities. No abnormal gastrulation and a lower incidence (mean < 1%) of vertebral deformities without bone erosion and hemorrhaging were encountered in controls. DDT concentrations in the eggs ranged from 0.39 to 4.60 (mean = 2.42 ppm) compared to 0.11-0.57 ppm (mean = 0.22 ppm) in the eggs from control flounder. No observable effect on development was noted in eggs from adults exposed experimentally only to dieldrin except in two lots of eggs most of which were dead and necrotic at spawning and contained 1.74 and 1.21 ppm dieldrin. No direct effect on fertilization mortality was due to gamete concentrations of DDT and dieldrin and no residues of either insecticide were detected in the milt from exposed or control male flounder. (Authors)

17602. Hakkari, Lasse (Jyväskylän Yliopisto, Vapaudenkatu 4, 40100 Jyväskylä 10, Finland). 1972. THE ROLE OF ZOOPLANKTON AS FOOD FOR VENDACE (Coregonus albula) IN LAKE KONNEVESI, CENTRAL FINLAND. (Konneveden eläinplanktonin merkityksestä muikun ravintona). Suomen Kalatalous, 46(1): 21-28. In Finnish.

The amount and production of zooplankton species and the role of zooplankton as food for planktivorous fishes, especially vendace, are examined on the basis of zooplankton and fish samples collected in May-October 1970 from the unpolluted, oligotrophic Lake Konnevesi. The most important prey species of vendace were Limnocalanus and Bosmina coregoni in the northern part of Konnevesi and Leptodora, Bosmina coregoni and Daphnia cristata in the southern part. The production of vendace was estimated at 20-25 kg/ha per year on the basis of the zooplankton production. The predation of vendace was found to have an effect on the species composition of the zooplankton. Strong predation diminished the amount of large (> 0.02 mg) species, so that the proportion of small species increased. (Auth.)

17603. Wollitz, Robert E. 1973. THE EFFECT OF ACID MINE DRAINAGE ON THE LIMNOLOGY OF A SMALL IMPOUNDMENT IN SOUTHWEST VIRGINIA. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 442-460.

Apparently extensive fish mortalities were reported to have occurred in the North Fork Pound Reservoir during February, 1969 and February, 1970. A study was initiated in September, 1969 and continued through October, 1970, in order to ascertain the causes of these mortalities. Chemical water analyses disclosed that the lake pH varied from 4.0-6.4, with a mean near 5.0. The heavy metals, copper, mercury, zinc, iron and manganese were found in the lake waters at levels reported to have chronic effects on fish. Biological investigations revealed fish populations were at low levels (smallmouth bass, channel catfish, largemouth bass, black crappie, green sunfish, bluegill, redear sunfish and brown and yellow bullheads). Reproduction of largemouth bass, green sunfish and black crappie appeared to be nonexistent. Standing crops of zooplankton and phytoplankton appeared extremely low. The reduction of the fishery and the low standing crops of plankton appeared to be due to the toxicity of copper, mercury, zinc and to some extent the toxicities of iron, manganese, and/or low pH, and low carbonate alkalinity. (Auth.)

17604. Gehringer, Jack W. (NMFS, Brunswick Lab., Brunswick, Georgia 31520). 1973. YOUNG FISHES OF A TIDAL ZONE IN COASTAL GEORGIA. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 158-159.

17605. Oganesyan, S. A. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Institut Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. HISTOGENESIS AND FUNCTIONING OF THE HYPOPHYSIS AND THYROID GLAND IN THE LARVAE OF ATLANTIC SALMON EXPOSED TO IONIZING RADIATION. AEC Translation 7418 from Trudy Polyar Nauch. Issled., pp. 53-65; Selected Water Resources Abstracts, 7(4): p. 62, 1974.

In the thyroid gland of larvae whose embryonal period transpired with chronic exposure to radiation, one can observe characteristic degenerative changes and impairments in release of the secretion. In the hypophysis one can detect growth of the parenchyma, consolidation of nuclei and an increased mitotic activity. Total irradiation in doses of 350 and 1000 R causes phase changes in the thyroid gland, expressed during the first stage in an intensification and later in a depression of secretory activity.

17606. Fabacher, David L., and Howard Chambers (Dept. of Entomol., Miss. State Univ., State College, Mississippi). 1973. APPARENT RESISTANCE TO PYRETHROIDS IN ORGANOCHLORINE-RESISTANT MOSQUITOFISH. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 461-464.

Organochlorine-resistant mosquitofish from an insecticide contaminated environment in the Mississippi Delta showed a 3.4-fold tolerance to pyrethrum when compared to a susceptible strain. The 24-hr LC50 values for pyrethrum in susceptible and resistant mosquitofish were 27 and 93 ppb, respectively. Results of studies with sesamex, an inhibitor of mixed-function oxidase (mfo) enzymes, indicated that the tolerance to pyrethrum is partially, but not solely the result of increased levels of mfo enzymes. Additional studies with allethrin show that increased carboxylesterase enzyme levels cannot explain the pyrethrum tolerance which was not accounted for by mfo enzymes; thus yet another mechanism must be involved. Resistant mosquitofish that had been maintained in an insecticide-free environment for several years also possessed a tolerance to pyrethrum but to a lesser degree than the original parents from the insecticide-contaminated area. Data suggest that the observed tolerance to pyrethrum is apparently in part a genetically based resistance involving two or more resistance mechanisms. (Authors)

17607. Warren, Charles E., Peter Doudoroff, and Dean L. Shumway (Dept. of Fish. & Wildl., Oregon State Univ., Corvallis, Oregon). 1973. DEVELOPMENT OF DISSOLVED OXYGEN CRITERIA FOR FRESHWATER FISH. Environ. Protection Agency, Ecological Res. Series EPA-R3-73-019, 122 p., available from Supt. of Documents, U. S. Govt. Printing Office, Wash., D. C. - $2.10; Univ. of Wisconsin Eutrophication Issue No. 38, p. 14, No. 5122.

Studies of the influence of dissolved oxygen concentration on the survival, development, bioenergetics and growth, swimming performance, and avoidance behavior of chinook and coho salmon, steelhead trout, and largemouth bass are described.

17608. June, Fred C., and Frank T. Carlson (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. FOOD AND FEEDING HABITS OF ATLANTIC MENHADEN IN RELATION TO METAMORPHOSIS OF LARVAE INTO JUVENILES. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 136-137.

We studied the food of young Atlantic menhaden (Brevoortia tyrannus) primarily to determine the kinds of organisms required for rearing this species in captivity. Food of larvae consisted of zooplankton (chiefly copepods), but shifted to phytoplankton during and following metamorphosis into juveniles. Close correspondence appeared between the alimentary tract contents of the fish and the composition of the plankton community. Changes in feeding habits during metamorphosis were associated with gross changes in the alimentary tract and related structures. Laboratory studies disclosed that larval feeding behavior, digestion rate, and responses to capture and preservation probably contributed to the high incidence of empty alimentary tracts and the low numbers of organisms per tract. (Authors)

17609. Amend, Donald F. (Western Fish Dis. Lab., Naval Support Activity, Seattle, Washington 98115). 1974. COMPARATIVE TOXICITY OF TWO IODOPHORS TO RAINBOW TROUT EGGS. Trans. Amer. Fish. Soc., 103(1): 73-78.

Toxicity of Wescodyne and Betadine to eyed eggs was not adversely affected by water hardness (as calcium and magnesium) or by exposure periods up to 60 min. Both iodophors were much more toxic below pH 6.0 than at pH 8.0. In general Wescodyne was slightly more toxic than Betadine. Significant egg loss occurred if freshly fertilized eggs were water-hardened in either iodophor at 100 ppm of iodine, but egg loss at 25 ppm of iodine or at 100 ppm if the eggs were disinfected 30 min after water hardening was comparable to the control. Also, there was no effect on the egg mortality or fry development following single or multiple exposures after eggs were water hardened. At pH 6.0 and above, Wescodyne and Betadine at 100 ppm iodine in a 15-min dip would be safe to use on rainbow trout eggs at any stage of development after water hardening. Recommendations and precautions for hatchery use are given. (Auth.)

17610. Cox, David T., and Dewey L. Bunting. 1973. EFFECTS OF SUB-LETHAL CONCENTRATIONS OF PHENOL ON EVENTS IN THE PRE-REPRODUCTIVE PERIOD OF THE CLADOCERAN, Daphnia magna. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 464-472.

The purpose of this investigation was to determine the effect of continuous exposure of pre-adult Daphnia magna to low, presumably sub-lethal doses of phenol. The experimental data were obtained through use of a standard 24-hour toxicity bioassay and a modified long-term toxicity bioassay. Control and test animals were cultured in a synthetic pond water and fed with dried yeast. Six concentrations of phenol were tested. Data were applied to least squares linear regression analysis, multiple linear regression analysis, crossed covariance analysis, and several related tests in order to quantitatively interpret the total effects of the chronic poisoning. It was found that phenol exhibited strong interaction with temperature of the culture medium and with the age of the individual to retard ecdysis. This results in a prolonged generation time. Mortality was also increased and reproduction was greatly inhibited. Combinations of these effects act to greatly reduce population growth rates. It is concluded that even minute amounts of phenol introduced into a natural environment may have deleterious effects on the ecological balance of an ecosystem. (Authors)

17611. Goddard, C. I., J. W. Lilley, and J. S. Tait (Dept. of Biol., York Univ., Toronto, Ontario, Canada). 1974. EFFECTS OF M.S. 222 ANESTHETIZATION ON TEMPERATURE SELECTION IN LAKE TROUT, Salvelinus namaycush. J. Fish. Res. Board Can., 31(1): 100-103.

Yearling lake trout (Salvelinus namaycush) were anesthetized with a 150 ppm solution of M.S. 222 for 2 min at 10 C. When tested in a vertical temperature gradient, their behavior was abnormal for 5 days following anesthetization. Initially, they remained at the bottom of the gradient tank, as much as 63% of the time, and when they did swim up into the gradient, their temperature selection was much less precise than that of control fish. The percentage of fish on the bottom declined daily, and on the 6th day their temperature distribution did not differ from that of controls. (Authors)

17612. Stenson, Jan A. E. (Univ. of Göteborg, Dept. of Zool., Fack, Göteborg, Sweden). 1973. ON PREDATION AND Holopedium gibberum (Zaddach) DISTRIBUTION. Limnol. Oceanogr., 18(6): 1005-1010.

Differences in temperature, pH, calcium content, specific conductivity, and food in eight small forest lakes did not account for differences in abundance and size of Holopedium gibberum. Variations in number and size of Holopedium may result from different predation rates caused by differences in fish species composition, fish density, and presence or absence of fish fry. (Auth.)

17613. UNESCO. 1973. MONITORING LIFE IN THE OCEAN. Sponsored by SCOR, ACMRR, UNESCO, IBM/PM, Unesco tech. papers in marine science, No. 15, 69 p.

17614. Kasatkina, S. V. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Institut Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk USSR). 1971. EFFECT OF STRONTIUM-90 + YTTRIUM-90 ON THE DEVELOPMENT AND FUNCTIONING OF THE HATCHING GLANDS IN ATLANTIC SALMON. AEC Translation 7418 from Trudy Polyar Nauch Issled, pp. 66-74; Selected Water Resources Abstracts, 7(4): 62, 1974.

A study was made of the morphophysiological state of the hatching glands in embryos developing under conditions of chronic contamination of water by Sr90 + Y90 (2.10 to the minus 5th power, 0.7.10 to the minus 6th power, 0.6.10 to the minus 7th power curie/liter) and also with a combined exposure Sr90 + Y90 2.10 to the minus 5th power curie/liter + 350 R. No changes in morphology of the hatching glands were discovered in a study of histologic specimens of the head part of experimental embryos. In all the experimental variants the action of the radioisotopes Sr90 + Y90 causes a more intensive enzyme accumulation by the hatching glands, whereas in variants with an activity of 2.10 to the minus 5th power, 0.7.10 to the minus 6th power and 0.6.10 to the minus 7th power curie/liter it leads to earlier onset of hatching in comparison with the control. With a combined exposure of the Atlantic salmon embryo the process of enzyme secretion by the hatching glands is slowed down; this can probably be attributed to the aftereffect of X-irradiation.

17615. Moe, Martin A., Jr. (Marine Lab., Florida Dept. of Nat. Res., St. Petersburg, Florida 33731). 1973. LARVAL AND JUVENILE FISH RESEARCHES AT THE FLORIDA BOARD OF CONSERVATION MARINE LABORATORY. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries NOAA Tech. Publ. No. 1, pp. 131-135.

Research efforts at the Marine Laboratory are concentrated on study of reproduction, early development, and distribution of indigenous species. Advances have been made in the identification and description of: leptocephali, scombrids, pomadasyids, lutjanids, and serranids. Species of sciaenids, gerreids, and blenniids have been raised to juvenile stages from wild plankton in special temperature-controlled tanks. (Auth.)

17616. O'Rear, Charles W., Jr. (Va. Coop. Fish. Unit, Div. of Forestry & Wildl. Sciences, Va. Polytech. Inst. and State Univ., Blacksburg, Virginia). 1973. THE TOXICITY OF ZINC AND COPPER TO STRIPED BASS EGGS AND FRY WITH METHODS FOR PROVIDING CONFIDENCE LIMITS. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 484-489.

Striped bass eggs, 24 hours after fertilization, and newly-hatched fry were tested to determine their sensitivity to zinc and copper. This study with those of Hughes will provide information on the most sensitive stage of these fish to acute exposure to lethal levels of zinc and copper. Newly-hatched fry were more sensitive to both zinc and copper than were eggs, but copper, at the lowest concentration used, retarded hatching. Eggs and fry were more sensitive to copper than to zinc. In order for acute toxicity studies to have a predictive value, confidence limits need to be placed on the TLm values obtained from toxicity studies. Results obtained from three different methods of providing confidence limits are discussed and the relative merits of each method are compared. (Auth.)

17617. Olmsted, Larry L., and Donald G. Cloutman (Dept. of Zool, Univ. of Arkansas, Fayetteville, Arkansas 72701). 1974. REPOPULATION AFTER A FISH KILL IN MUD CREEK, WASHINGTON COUNTY, ARKANSAS FOLLOWING PESTICIDE POLLUTION. Trans. Amer. Fish. Soc., 103(1): 79-87.

Repopulation after a fish kill caused by pesticide pollution in Mud Creek, Washington County, Arkansas is reported. Twenty-nine species of fishes were eliminated from the study area as a result of the poison. Repopulation began almost immediately after the pesticide dissipated, and was accomplished primarily by immature individuals. Chronology and rate of repopulation of each species are reported, and factors influencing the rate of repopulation and population structure are discussed. (Authors)

17618. Mathur, Dilip, and John S. Ramsey (Ala. Coop. Fish. Unit, Agric. Exp. Sta., Auburn Univ., Auburn, Alabama 36830). 1974. REPRODUCTIVE BIOLOGY OF THE ROUGH SHINER, Notropis baileyi, IN HALAWAKEE CREEK, ALABAMA. Trans. Amer. Fish. Soc., 103(1): 88-93.

Monthly changes in mean ova diameter and gonadal weights indicated that spawning of rough shiner, Notropis baileyi, a cyprinid recently introduced in Halawakee Creek (Apalachicola River Drainage), Alabama, occurred during early or middle May through late September or early October. Peak spawning occurred in early or middle June. Several complements of ova matured. Fecundity was linearly related to length and weight of the fish. No significant correlation existed between the diameter of ova and fork length of fish. Versatile food habits, a long successful spawning season and favorable habitat are believed to be the key to the success of this shiner in Halawakee Creek. (Authors)

17619. Huzyk, L., and H. Tsuyuki (Dept. of the Environ., Fish. and Mar. Serv., Vancouver Lab., Vancouver, Brit. Columbia V6T 1X2, Canada). 1974. DISTRIBUTION OF LDH-B'' GENE IN RESIDENT AND ANADROMOUS RAINBOW TROUT (Salmo gairdneri) FROM STREAMS IN BRITISH COLUMBIA. J. Fish. Res. Board Can., 31(1): 106-108.

The B'' subunit of lactate dehydrogenase from the liver tissue of wild populations of resident rainbow trout (Salmo gairdneri) from the Loon and Pennask Lake areas has been found in a frequency of 0.400-0.800. An electrophoretically identical subunit was found in similar proportions in anadromous steelhead trout from the Thompson River, and from the Coquihala River in considerably smaller proportions. Steelhead from some coastal streams in and near Vancouver and Vancouver Island, and other selected streams from the Fraser and Skeena river systems generally revealed a very low frequency of less than 0.1. (Authors)

17620. McGary, Jerry L., and George L. Harp (Arkansas State Univ., State University, Arkansas 72467). 1973. THE BENTHIC MACROINVERTEBRATE COMMUNITY OF THE GREER'S FERRY RESERVOIR COLD TAILWATER, LITTLE RED RIVER, ARKANSAS. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 490-500.

This study provides an evaluation of the benthic faunal characteristics of the cold tailwater of Greer's Ferry Reservoir on Little Red River. This Ozark stream is characterized by cold and non-turbid water, and periodic drastic vacillation of water level, the results of a deep water discharge for hydroelectric generation. For these reasons the benthic macroinvertebrate community is qualitatively limited. Pool and riffle habitats were sampled at six-week intervals at each of three stations established between 500 m-23 km below the dam. Most physicochemical characteristics measured were found not limiting, except water temperature and current velocity. Benthic organisms were limited to 59 taxa. Longitudinal zonation was characterized by an increase in diversity downstream with 15, 32, and 41 taxa collected at Stations 1, 2, and 3, respectively. Overall dominant organisms numerically were oligochaetes, chironomids and isopods. Oligochaetes composed 62-79% of pool organisms collected. Isopods dominated riffles with 37-81% of organisms collected. Chironomids were usually the second most abundant in riffles and pools. The mean numerical standing crop was greatest at Station 1 with 1,241 organisms/m^{-2} and lowest at Station 2 with 437 organisms m^{-2}. (Authors)

17621. Keppner, Edwin J. (Biol. Dept. Central Missouri State Univ., Warrensburg, Missouri). 1974. THE LIFE HISTORY OF Paulisentis missouriensis N. Sp. (ACANTHOCEPHALA: NEOECHINORHYNCHIDAE) FROM THE CREEK CHUB Semotilus atromaculatus. Trans. Amer. Microsc. Soc., 93(1): 89-100.

Paulisentis missouriensis n. sp. is described from the intestine of Semotilus atromaculatus in Missouri. It differs from the other members of the genus by a combination of characters including the length and morphology of the proboscis retractor muscles, shape of the apical organ, length of the lemnisci, and arrangement of the acanthor hooks. The developmental stages are described from the copepod Cyclops vernalis. (Auth.)

17622. Lebida, Robert C. (Dept. of Forestry & Wildlife Mgmt, Univ. of Massachusetts, Amherst, Massachusetts 01002). 1973. SEASONALITY OF ICHTHYOPLANKTON IN THE WEWEANTIC RIVER ESTUARY. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, p. 139.

A 1-year study of the seasonal occurrence of eggs and larvae of fishes in the Weweantic River estuary entering Buzzards Bay, Massachusetts, was conducted from January 1966 through December 1966 as a phase of a longer term program on the ecology of fishes in this system. The estuary is 7.5 km long and was sampled monthly at six stations using a 0.5-m net for surface tows and a bottom macroplankton sampler for bottom hauls. Salinity and temperature data were collected concurrently. A detailed sediment analysis was also carried out on the river as well as gill netting, beach seining, and otter trawling at selected stations for juveniles and adults. Fifty-two species of fishes either in the egg, larval, juvenile, or adult stages, or in combinations thereof, have been collected in the estuary of the river since the larger project's inception in December 1964. Fish eggs and larvae of 28 species have been identified from samples collected during the study year. The sampling program is continuing with weekly sampling during the spring and summer, twice the monthly sampling of the first year's study. The seasonal cycle of eggs, larvae, and juveniles during 1966 was similar to other studies in Connecticut and Rhode Island estuaries; numbers and variety gradually increased in the spring to a peak in abundance in summer followed by a decline in fall and winter. Two notable peaks of egg and larval abundance occurred; one during March was composed primarily of rainbow smelt, winter flounder, and tomcod, and a second one in June, primarily of cunner and tautog. (Auth.)

17623. Sanderson, J. M. (Dept. of Nat. Hist., Royall Scottish Mus., Edinburgh, Scotland). 1974. A NEW OCCURRENCE OF THE PARASITICAL COPEPOD Lernaea cyprinacea (L.). J. Fish Biol., 6(1): 77-78.

The first occurrence of Lernaea cyprinacea (L.) in Scotland is given together with a summary of Lernaea records for Britain including one other unpublished record. Source of the infection is discussed and host fish involved listed. General characters of the Scottish specimens are compared with those of Demaree, Fryer, Hu and Wilson. (Auth.)

17624. Koshleva, V. V. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Inst. Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. CHANGE IN PERIPHERAL BLOOD IN THE EMBRYOS AND LARVAE OF ATLANTIC SALMON UNDER THE INFLUENCE OF RADIOACTIVE CONTAMINATION OF THE WATER AND X-RAYS. AEC Translation 7418 from Trudy Polyar Nauch. Issled., pp. 75-88; Selected Water Resources Abstracts, 7(4): p. 62, 1974.

A study was made of the effect of chronic exposure to Sr90 + Y90 of different concentrations on the morphological composition of the red blood of Atlantic salmon embryos and larvae. In the egg blastula stage in the aquarium with Sr90 + Y90 with an activity of 2.20 to the minus 5th power curie/liter there was additional irradiation by X-rays in a dose of 350 R. It was established that a characteristic manifestation of the action of Sr90 + Y90 is a considerable depression in the rate of maturing of formed blood elements and the appearance of cells with different morphological changes. The degree of the radiation effect increases with an increase in the radioactive isotope in the water. With a combined exposure there was no additional changes with respect to the variant with Sr90 + Y90 (2.10 to the minus 5th power curie/liter).

17625. Webb, C. J. (Dept. of Zool., Univ. of Bristol, Bristol, England). 1974. FISH CHROMOSOMES: A DISPLAY BY SCANNING ELECTRON MICROSCOPY. J. Fish Biol., 6(1): 99-100.

This note reports the first display of fish chromosomes by scanning electron microscopy and assesses the value of this technique to fish karyology. (Auth.)

17626. Poston, Hugh A., Donald L. Livingston, and Dale G. Hedrick (Bur. of Sport Fish. & Wildl., Tunison Lab. of Fish Nutr., Cortland, New York 13045). 1973. EFFECT OF METHOD OF INTRODUCING WELL WATER ON THE GROWTH, BODY CHEMISTRY, AND INCIDENCE OF EYE ABNORMALITIES OF JUVENILE BROWN AND RAINBOW TROUT. Progr. Fish-Cult., 35(4): 187-190.

Juvenile brown (Salmo trutta) and rainbow (S. gairdneri) trout held in well water dispensed through metal, single-aperture flow regulators for 36 wk were larger, showed better food conversion, fewer eye abnormalities (exophthalmia, missing eyes, and cataracts) and mortalities than those held in water delivered by multiperforated polyvinyl chloride pipe. The brown trout, regardless of type of water delivery, were smaller, more susceptible to popeye, and contained less tissue fat and more water than the rainbow trout. Chronic exposure of fish to elevated levels of dissolved nitrogen in water from the perforated PVC pipe is believed to be the cause of the higher incidence of eye abnormalities. (Authors)

17627. Burt, M. D. B., and I. M. Sandeman (Dept. of Biol., Univ. of New Brunswick, Fredericton, New Brunswick, Canada). 1974. THE BIOLOGY OF Bothrimonus (= Diplocotyle) (PSEUDOPHYLLIDEA: CESTODA): DETAILED MORPHOLOGY AND FINE STRUCTURE. J. Fish. Res. Board Can., 31(2): 147-153.

Light and electron microscopy were used to describe the functional morphology of Bothrimonus sturionis in detail. In particular, the musculature, nervous system, osmoregulatory system, and tegument are dealt with, and the findings compared with those of other workers. The musculature of the scolex consists of several interrelated systems, the structure of each being discussed in relation to its function. Associated with the regular nervous system, considered typical of cestodes, is an extensive system of giant nerve fibers. The osmoregulatory system is unusual in that there are lateral "excretory" pores in many proglottides which open directly to the exterior of the worm. The microtriches of the tegument are long, like those of other primitive cestodes, and are covered by a noncellular sheath while the worm is in its gammarid host. The sheath is lost when the worm becomes established in its fish host; the nature and function of the sheath are discussed. (Authors)

17628. Titlow, Franklin B., and Robert T. Lackey (Dept. of Fish. & Wildl. Sci., Va. Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1973. COMPUTER ASSISTED INSTRUCTION IN NATURAL RESOURCE MANAGEMENT. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 500-505.

Teaching natural resource management is especially difficult because of the importance of experience in making management decisions. Most methods for allowing natural resource students to gain management experience in the classroom have not been entirely satisfactory. Computer implemented simulation of natural resource problems allows educators to provide management experience to students. TROUT, a learning exercise which simulates a coldwater lake fishery, is discussed as an example of the role of these teaching tools. (Authors)

17629. Bowman, Edgar W. (Exploratory Fishing and Gear Research Base, Bur. of Comm. Fish., Ann Arbor, Michigan). 1974. LAKE ERIE BOTTOM TRAWL EXPLORATIONS, 1962-66. NOAA Tech. Report NMFS SSRF-674, 21 p., illus.

The Bureau of Commercial Fisheries (now the National Marine Fisheries Service) Exploratory Fishing and Gear Research Base, at Ann Arbor, Mich., surveyed the abundance, availability to the otter (bottom) trawl, and depth distribution of various Lake Erie fish stocks between April 1962 and October 1966. The four exploratory cruises, conducted aboard the research vessel Kaho, clearly demonstrated the effectiveness of the bottom trawl in producing commercial quantities of yellow perch, Perca flavescens, and rainbow smelt, Osmerus mordax. Freshwater drum, Aplodinotus grunniens; carp, Cyprinus carpio; channel catfish, Ictalurus punctatus; and white bass, Roccus chrysops, were all produced in commercial quantities at least once during the study and collectively accounted for 17.1% of the total landings. Between the first exploratory cruise in 1962 and the last in 1966 the abundance of yellow perch decreased significantly, and that of alewife, Alosa pseudoharengus, increased dramatically. (Auth.)

17630. Cisar, J. O., and J. L. Fryer (Dept. of Microbiol., Oregon State Univ., Corvallis, Oregon 97331). 1974. CHARACTERIZATION OF ANTI-Aeromonas salmonicida ANTIBODIES FROM COHO SALMON. Infect. Immun., 9(2): 236-243.

Coho salmon (Oncorhynchus kisutch) anti-Aeromonas salmonicida agglutinins were excluded from Sephadex G-200 and their activity was lost after partial reduction and alkylation followed by exposure to 2 M urea. Immunoelectrophoretic analysis of coho antiserum revealed anodic and cathodic populations of immunoglobulin (Ig), and the anti-A. salmonicida antibodies present 12 weeks after parenteral immunization were primarily anodic Ig. Antibodies were specifically purified by dissociation of A. salmonicida cell wall agglutinates with 15% NaCl. The purified Ig was a 17S macroglobulin, and electron microscopy and sodium dodecyl sulfate-polyacrylamide gel electrophoresis revealed that it was composed of four IgM-like subunits. The minimum coho antibody concentration required for visible agglutination of A. salmonicida cells was approximately 0.006 μg of Ig nitrogen/ml. (Authors)

17631. Regier, H. A. (Dept. of Zool, Univ. of Toronto, Toronto, Ontario, Canada). 1973. SEQUENCE OF EXPLOITATION OF STOCKS IN MULTISPECIES FISHERIES IN THE LAURENTIAN GREAT LAKES. J. Fish. Res. Board Can., 30(12): 1992-1999.

The Laurentian Great Lakes have been fished with gradually increasing intensity for about 150 years. Their fish communities have been stressed by a broadening variety of other cultural influences besides fishing. A series of recent analyses have identified and distinguished effects due to fishing from those due to other cultural stresses. These analyses are here carried a step further, showing the fishing-up and overfishing sequence, through time, of various species as a function of their economic value to the fishermen. Some elements of a theory are proposed that interrelate a number of whole-system variables; if elaborated further such a theory should be useful in modelling and managing competing fisheries that harvest a number of ecologically interrelated species, perhaps more or less indiscriminately. Further, the theory should permit modelling and managing of other cultural stresses on the fish community, such as nutrient loading and toxic pollution that may act contemporaneously with fishing. (Auth.)

17632. Shelton, William L., and Bobby G. Grinstead (Ala. Coop. Fish. Unit, Auburn, Alabama). 1973. HYBRIDIZATION BETWEEN Dorosoma cepedianum AND D. petenense IN LAKE TEXOMA, OKLAHOMA. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 506-510.

The level of natural hybridization in Lake Texoma between Dorosoma cepedianum and D. petenense for the years 1962-63 and 1968-69 was determined to be 2.5 and 1.7% respectively. The two species have been sympatric in that reservoir since 1957. Male and female hybrids with well developed gonads were collected. Eggs from a hybrid were fertilized experimentally with milt of D. petenense and produced viable larvae. Hybrid fry were produced in the laboratory by crosses between D. cepedianum males and D. petenense females but not the reciprocal. Spawning of the two species is discussed in relation to the possible means of natural hybridization. (Authors)

17633. Marriott, Richard A. (Alaska Dept. of Fish & Game, Juneau, Alaska 99801). 1973. EFFECTS OF ELECTRIC SHOCKING ON FERTILITY OF MATURE PINK SALMON. Progr. Fish-Cult., 35(4): 191-194.

Mortality to eyed stage of pink salmon (Oncorhynchus gorbusha) eggs increased by 11.8% when females were electrocuted with 110-v 60-cycle a.c. current prior to an egg take. No change occurred in sperm viability from electrocuted males. Postfertilization shocking of water-hardened eggs also resulted in increased mortality. Cause of egg mortality appeared to be a cumulative effect of shocking, but may also have been associated with ruptured internal organs noted in 10% of the shocked females. (Auth.)

17634. GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Pollution, IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN). 1973. REPORT OF THE FIFTH SESSION, VIENNA, 18-23 JUNE 1973. GESAMP V/10, 87 p., Original: English.

17635. Luhning, Charles W. (Southeastern Fish Control Lab., Warm Springs, Georgia). 1973. METHODS FOR SIMULTANEOUS DETERMINATION AND IDENTIFICATION OF MS-222 AND METABOLITES IN FISH TISSUES. U. S. Dept. of the Interior, Bur. of Sport Fish. & Wildl., Investigations in Fish Control No. 51, pp. 1-10. For sale by Supt. of Documents, Wash., D. C. - price 60 cents.

MS-222 (methanesulfonate of meta-aminobenzoic acid ethyl ester) is a primary aromatic amine commonly used to anesthetize fish. Like all primary aromatic amines, its diazonium salt reacts with N-1-naphthylethylenediamine dihydrochloride to form a wine-red azo dye with a maximum absorbance at 545 nm. Basic carbon tetrachloride extraction separates the azo dyes of MS-222 and its acid metabolite, m-aminobenzoic acid, and quantitative determination of each compound is made colorimetrically. By this method, recoveries of 82 to 110 percent for MS-222 and 84 to 117 percent for m-aminobenzoic acid were obtained from largemouth bass muscle and liver tissues spiked with 1 to 10 μg/g of each compound. Confirmation of MS-222 and m-aminobenzoic acid residues in fish tissue was made by thin-layer chromatography. Quantitative estimation and identification of each compound were possible from samples spiked with as little as 1 μg/g of MS-222 or m-aminobenzoic acid. (Auth.)

17636. Smith, Roderick (Div. of Nat. Sci. and Math., Stockton State College, Pomona, New Jersey 08240). 1973. PESTICIDE RESIDUES AS A POSSIBLE FACTOR IN LARVAL WINTER FLOUNDER MORTALITY. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ., No. 1, pp. 173-180.

Unusually high mortality of larval winter flounder occurred in the Weweantic River estuary, Wareham, Massachusetts, during the 1965 spawning season. Pesticide residues were suspected to be the possible lethal agent because of large-scale use of these compounds in the watershed. The procedure followed included analyses of winter flounder tissues for pesticide residues, using electron capture gas chromatography, monthly from July 1966 to June 1967. Evidence of seasonal patterns of accumulation and metabolic breakdown appeared for DDT, DDE, heptachlor, and heptachlor epoxide. Dieldrin was present in relatively small quantities in all the monthly samples. Parathion appeared only in the July 1966 sample. A relation between the life history of the winter flounder and the accumulation of pesticide residues was evident. Female flounder concentrated certain of the pesticides in the ripening ovaries as the spawning season approached. Chromatographic patterns from the Weweantic flounder analyses proved to be qualitatively unique when compared to analyses on flounder from other areas off the Massachusetts coast. The possibility of pesticidal influence on the survival of larval winter flounder is thought to exist. (Auth.)

17637. Hastings, W. H. (Bur. Sport Fish. & Wildl., Fish Farming Exp. Sta., Stuttgart, Arkansas 72160). 1973. PHASE FEEDING FOR CATFISH. Progr. Fish-Cult., 35(4): 195-196.

Continued evidence was shown of increased catfish production with higher amounts of protein in the diet. More profit with phase feeding indicates that the protein level in feeds may be adjusted to fish growth as regulated by water temperature. (Auth.)

17638. Walder, Gordon L., and Hisao P. Arai (Dept. of Environ., Fish. and Mar. Serv., Pacific Biol. Sta., Nanaimo, Brit. Columbia, Canada). 1974. THE HELMINTH PARASITES OF EMBIOTOCID FISHES. III. A NEW SPECIES OF THE GENUS Cucullanellus Tõrnquist, 1931 (NEMATODA: CUCULLANIDAE) FROM THE SHINEk PERCH, Cymatogaster aggregata Gibbons. J. Fish. Res. Board Can., 31(2): 205-209.

Cucullanellus kanabus sp. nov., parasitic in the intestine of the embiotocid fish, Cymatogaster aggregata Gibbons from Departure Bay, British Columbia is described and illustrated. The main features distinguishing C. kanabus from previously described species in the genus are the arrangement of the caudal papillae in males, the general body shape and various measurements. The species considered referable to Cucullanellus Tornquist 1931 are listed. (Authors)

17639. Dawson, Verdel K., and Leif L. Marking (Fish Control Lab., La Crosse, Wisconsin). 1973. TOXICITY OF MIXTURES OF QUINALDINE SULFATE AND MS-222 TO FISH. U.S. Dept. of Interior, Bur. of Sport Fish. & Wildl., Investigations in Fish Control No. 53, pp. 1-11.

The acute toxicities of mixtures of two fish anesthetics (quinaldine sulfate and MS-222) to coho salmon, rainbow trout, brown trout, brook trout, lake trout, carp, channel catfish, bluegill, and largemouth bass of various sizes were determined in 15-, 30-, and 60-minute and 24-, 48-, and 96-hour static toxicity tests. The effects of various temperatures, water hardnesses, and pH's on the mixture's toxicity were evaluated. The 96-hour LC50's of $QdSO_4$:MS-222 in ratios of 1:4 ranged from 4.23:16.9 mg/l for lake trout to 8.63:34.5 mg/l for carp in standard reconstituted water at 12°C. Temperature changes had little influence on the effect of the drugs. In very soft water, solutions of the combination are acidic and considerably less toxic than in harder water. The toxicity of the mixture decreases with decreasing pH, especially below pH 6.5. Safety indices (lethal concentration/effective concentration) indicate that the safety margin is greater at shorter exposures. (Authors)

17640. Range, James D. (Dept. of Biol., Tenn. Technological Univ., Cookeville, Tennessee 38501). 1973. GROWTH OF FIVE SPECIES OF GAME FISHES BEFORE AND AFTER INTRODUCTION OF THREADFIN SHAD INTO DALE HOLLOW RESERVOIR. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 510-518.

The possible effect of threadfin shad stocking in Dale Hollow Reservoir on the growth of five predatory species was measured by analysis of scale samples taken before and after threadfin stocking. There was no significant change in growth rate of largemouth bass, Micropterus salmoides; smallmouth bass, Micropterus dolomieui; and spotted bass, Micropterus punctulatus. There was a significant increase in growth rate of walleye, Stizostedion vitreum and white crappie, Pomoxis annularis. (Auth.)

17641. Fowler, L. G. (Bur. Sport Fish. & Wildl., Abernathy Salmon Cultural Development Center, Longview, Washington 98632). 1973. TESTS OF THREE VITAMIN SUPPLEMENTATION LEVELS IN THE ABERNATHY DIET. Progr. Fish-Cult., 35(4): 197-198.

Feeding trials using steelhead trout (Salmo gairdneri) fingerlings were conducted at the Abernathy Salmon Cultural Development Center, Longview, Wash., during 1972-73 to determine the effect of feeding an increased vitamin supplenent in the Abernathy diet. The results indicated that growth was reduced when a low level of vitamin E was fed. Low levels or absence of other vitamins did not affect growth when the intake of vitamin E was adequate. The blood from fish which were fed the regular Abernathy vitamin supplement and then starved had a faster rate of decline in percent hematocrit values than starved fish which had previously been fed the McNenny trout diet vitamin supplement. (Auth.)

17642. Withey, Kathryn G., and Richard L. Saunders (Dept. of Environ., Fish. and Mar. Serv., Biol. Sta., St. Andrews, New Brunswick, Canada). 1973. EFFECT OF A RECIPROCAL PHOTOPERIOD REGIME ON STANDARD RATE OF OXYGEN CONSUMPTION OF POSTSMOLT ATLANTIC SALMON (Salmo salar). J. Fish. Res. Board Can., 30(12): 1898-1900.

Postsmolt Atlantic salmon (Salmo salar) subjected to a reciprocal photoperiod regime (decreasing daylength from early March and increasing daylength from late June) had significantly lower standard rates of oxygen consumption than those subjected to a simulated natural photoperiod regime when both were tested in total darkness in sea water in late summer. A reduced metabolic level, as indicated by the low standard rate of oxygen consumption, in the test fish is consistent with earlier observations of reduced feeding and growth rates and food conversion efficiencies in similarly treated fish following transfer to sea water. (Authors)

17643. Rose, Curt D., and W. W. Hassler (Chesapeake Biol. Lab., Nat. Res. Inst., Univ. of Maryland, Solomons, Maryland 20688). 1974. FOOD HABITS AND SEX RATIOS OF DOLPHIN Coryphaena hippurus CAPTURED IN THE WESTERN ATLANTIC OCEAN OFF HATTERAS, NORTH CAROLINA. Trans. Amer. Fish. Soc., 103(1): 94-100.

Dolphin caught by charter boats fishing over the Continental Shelf in 1961-63 were examined to determine food habits and sex ratios. Most important prey (listed according to percent of total prey weight) were: Exocoetidae (26%), Scombridae (22%), Carangidae (12%), Balistidae (9%), and Coryphaenidae (5%). Males constituted a significant majority (60%) of large dolphin (801-1,275 mm fork length). Most (71%) small dolphin (450-600 mm) were females. Large dolphin of both sexes were generally captured in open water, while small female dolphin were usually associated with tide-lines (areas where current patterns cause accumulations of floating Sargassum and other flotsam). In 1963, tide-lines were infrequently encountered by charter boats. Decreased charter boat catches, increased abundance of young males in the fishery, and impaired foraging by small female dolphin resulted. We hypothesize that male dolphin (which are heavier than females of similar length) leave the sanctuary of the tide-line at an earlier age than females to forage for large prey in the open ocean. Thus, most small dolphin captured near tide-lines and associated flotsam are females. Most large dolphin captured by trolling are males, because their significantly greater weight per unit of length results in more voracious feeding and increased selection by the charter boat fishery. (Authors)

17644. Davis, Jackson (Va. Inst. of Mar. Sci., Gloucester Point, Virginia 23062). 1973. SPAWNING SITES AND NURSERIES OF FISHES OF THE GENUS Alosa IN VIRGINIA. Proc. Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 140-141.

The paper presented is a progress report covering the first year of a project designed to extend 5 years or more and conducted under provisions of the Anadromous Fish Act (P.L. 89-304) through the Bureau of Commercial Fisheries (Project No. Virginia AFC-1). Objectives that are germane to this conference are: 1. Geographical delimitation of spawning sites and nurseries of Alosa aestivalis, blue-back; A. pseudoharengus, alewife; A. sapidissima, American shad; and A. mediocris, hickory shad. 2. Description of communities, chemical and physical features of spawning sites and nurseries. 3. Determination of criteria for successful spawning and growing. The four species spawn in fresh tidal waters. The alewife and blueback spawn both in the mainstream and in small tributary streams, while American shad spawns primarily in the mainstream. The major spawning of hickory shad appears to be in the mainstream at the fall line, but some may spawn further downstream and in tributaries. Juveniles remain in freshwater until the temperature drops in October and November. The juveniles move durther downstrea as fall progresses. Most American shad leave the estuaries in early fall. Alewife remain well into fall, and some blueback herring remain through winter. Some young of the three species overwinter in lower Chesapeake Bay. Additional work is needed on determining the departure time of juveniles. (Auth.)

17645. Tucker, William H. (Dept. of Fish. and Allied Aquacultures, Auburn Univ., Auburn, Alabama). 1973. FOOD HABITS, GROWTH, AND LENGTH-WEIGHT RELATIONSHIPS OF YOUNG-OF-THE-YEAR BLACK CRAPPIE AND LARGEMOUTH BASS IN PONDS. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 565-577.

Food, growth and length-weight relationships of young-of-the-year largemouth bass (Micropterus salmoides) and black crappie (Pomoxis nigromaculatus) were studied. Stomachs of 220 bass and 186 crappie were examined. Crappie fed mainly on zooplankton but consumed more aquatic insects as their size increased. Bass fed on zooplankton and aquatic insects, but grew faster when small crappie were available. Crappie grew faster when their numbers were reduced by bass predation. Length-weight relationships were calculated for 601 bass and 496 crappie. (Auth.)

7646. Keenleyside, Miles H. A., R. K. Misra, and David W. Bateson (Dept. of ool., Univ. of Western Ontario, London, Ontario, Canada). 1973. EXTENDED NALYSIS OF HYBRIDIZATION IN SUNFISHES (CENTRARCHIDAE) USING AN DJUSTED HYBRID INDEX METHOD. J. Fish. Res. Board Can., 30(12): 1901-904.

Sunfish collected from Pinehurst Lake, Ontario, were sorted into three groups: uegill (Lepomis macrochirus), pumpkinseed (L. gibbosus), and a group possessing ome of the color patterns of each of the other two. Eleven morphological characters each fish were analyzed by a hybrid index method, and by an adjusted index which lowed: a) calculation of sampling variances of individual and mean index estimates id, b) testing of hypotheses about the position of suspected hybrids relative to the irental populations. This method, applied to single characters and to combinations characters, showed that the anomalous group resembled bluegills in four charac-rs, pumpkinseeds in one, and were exactly intermediate in the others. The mplest explanation of these results is that the intermediate group was a population bluegill X pumpkinseed hybrids. This use of the hybrid index permits increased ecision over earlier methods in comparing suspected hybrid individuals with eir putative parent populations. (Authors)

7647. Burnett-Herkes, James (Univ. of Miami, Rosenstiel School of Mar. and tmospheric Sci., Miami, Florida 33149). 1974. PARASITES OF THE GILLS ND BUCCAL CAVITY OF THE DOLPHIN, Coryphaena hippurus, FROM THE TRAITS OF FLORIDA. Trans. Amer. Fish. Soc., 103(1): 101-106.

Parasites were studied from the gill and buccal areas of 145 dolphins, Coryphaena hippurus Linnaeus, caught in the Straits of Florida. Dolphin were infested ith a digenetic trematode, Bathycotyl branchialis Darr, and copepods, Charopinopsis quaternius Wilson, Caligus belones Krøyer, C. bonito Wilson, C. coryphaenae eenstrup and Lutken, C. patulus Wilson, C. productus Dana, C. quadratus Shiino, nd Euryphorus nordmanni Milne-Edwards. Parasite-mix, incidence, and inten-ty of infestation increased with increase in host size except that Caligus bonito nd Charopinopsis quaternius were not found on fish larger than 1,000 mm. No gnificant relationships were found between host sex and parasite-mix, incidence, nd intensity of infestation. Seven pairs of parasite species showed either positive- or negatively significant interrelationships. C. hippurus is a new host record r Caligus bonito, C. patulus and Bathycotyl branchialis. (Auth.)

7648. Luhning, Charles W. (Southeastern Fish Control Lab., Warm Springs, eorgia). 1973. RESIDUES OF MS-222, BENZOCAINE, AND THEIR METABO-ITES IN STRIPED BASS FOLLOWING ANESTHESIA. U. S. Dept. of Interior, ur. Sport Fish. & Wildl., Investigations in Fish Control No. 52, pp. 1-11.

Striped bass (Morone saxatilis) anesthetized in a 100-mg/l solution of MS-222 17.5°C contained an average of 57.9 μg/g of MS-222 and 23.3 μg/g of m-amino-enzoic acid residues in the muscle tissue immediately after a 30-minute exposure the drug (0-hour withdrawal samples). After this tissue was homogenized and ored in a refrigerator for 1 week at 1.7°C, residues were 100 percent m-amino-enzoic acid. Fish anesthetized with benzocaine and treated in like manner still ntained residues of benzocaine and a small amount of p-aminobenzoic acid (3.4 ercent) after storage. The ester and acid residues of both anesthetics decreased eadily with length of recovery time. The residues were measured by a modified ratton-Marshall colorimetric method and confirmed by thin-layer chromatography. Auth.)

7649. Masoni, A., and P. Payan (Lab. de Physiol. cell. and Lab. de Physiol. omp., U.E.R.S.E.N., Parc Valrose 06034, Nice Cedex, France). 1974. UREA, NULIN AND PARA-AMINO-HIPPURIC ACID (PAH) EXCRETION BY THE GILLS F THE EEL, Anguilla anguilla L. Comp. Biochem. Physiol., 47(4A): 1241-1244.

Branchial and renal excretion of inulin, para-amino-hippuric acid (PAH) and rea have been studied in Anguilla anguilla adapted to fresh water (FW) and sea ater (SW). These organic compounds are cleared at the same rate by gills and idneys in SW and FW. At the branchial level, inulin excretion is the same in W and SW, PAH seems to be cleared more rapidly in SW than in FW, whereas rea excretion is significantly decreased in SW compared to FW. (Authors)

17650. Henderson, H. F., R. A. Ryder, and A. W. Kudhongania (Fish. Resource Div., Dept. of Fish., FAO of the United Nations, Rome, Italy). 1973. ASSESSING FISHERY POTENTIALS OF LAKES AND RESERVOIRS. J. Fish. Res. Board Can., 30(12): 2000-2009.

Timeliness in estimating fishery potentials seems more important than precision, at least in the earlier periods of development of specific fisheries. Comparative studies of several sets of lakes, particularly of those supporting developing fisheries in Africa, suggest that potential yield may be related to several simple indices of production. The morphoedaphic index, derived from measures of total dissolved solids and the mean depth, has provided the simplest and most general approach to the problem of initial estimates of potential yield in lakes and reservoirs. Other methods of relating yield to nutrient concentration and primary production reinforce the concept of the dependence of potential yield on lake productivity. During the developing phase of a fishery more direct methods of estimating potential yield, through estimates of the production of the extant stocks, are also being used with some success. These have been adapted from fishery models developed for single stocks. In keeping with the need for rapid assessments during development, the simplest models have been emphasized. An equivalence between production and the product of biomass and mortality rate, along with the assumption that from 30 to 50% of the production of a stock is potentially harvestable, appears particularly useful. The problem of additivity of the potential yields of individual stocks seems relatively unimportant in first-order estimates, though the question of interactions is being examined, particularly in Lake Tanganyika. Programs of monitoring relative abundance of stocks over time have also been useful, both in indicating the approach of actual to potential yield and, after "calibration" against actual yields, as indices of stock and total biomasses. (Authors)

17651. Aggus, Larry R. (So. Central Reservoir Investigations, Bur. Sport Fish. and Wildl., Fayetteville, Arkansas). 1973. FOOD OF ANGLER HARVESTED LARGEMOUTH, SPOTTED AND SMALLMOUTH BASS IN BULL SHOALS RESERVOIR. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 519-529.

Stomachs from angler-harvested specimens of 259 largemouth bass, Micropterus salmoides, 263 spotted bass, M. punctulatus, and 256 smallmouth bass, M. dolomieui were collected from the mid-lake region of Bull Shoals Reservoir during March 1971 - February 1972. Stomach contents were compared on the basis of frequency of occurrence, weight, and seasonal distribution of food items. Black basses were piscivorous in feeding habits during the summer and early autumn, with young of the year shad contributing substantially to the diets. Utilization of young shad by adult basses followed shad spawning by six to eight weeks. During late autumn and in the spring, food habits of the three species varied. Largemouth bass stomachs contained primarily crayfish and centrarchids during the late autumn and crayfish, yearling shad and unidentified fish remains during the winter and spring months. Spotted bass fed primarily on crayfish throughout the period. Smallmouth bass stomachs contained centrarchids and crayfish during the late autumn and winter, and non-burrowing mayflies (Stenonema sp.) and unidentified fish during the spring. Total black bass production in Bull Shoals during the twentieth year of impoundment appeared to be primarily dependent upon clupeid and crayfish availability. (Auth.)

17652. Miller, John M. (Lab. of Limnol., Univ. of Wis., Madison, Wisconsin 53706). 1974. THE FOOD OF BROOK TROUT Salvelinus fontinalis (Mitchill) FRY FROM DIFFERENT SUBSECTIONS OF LAWRENCE CREEK, WISCONSIN. Trans. Amer. Fish. Soc., 103(1): 130-134.

Brook trout fry in Lawrence Creek consumed more chironomids, simuliids, and ephemeropterans than trichopterans or amphipods during their first 6 months of life. Diets of fry from different sections of the stream were similar. Fry captured from upstream sections were consistently longer (5 to 12 mm) than those taken from downstream sections. This differential is explained on a basis of preferential upstream migration of larger fry during the period of the study. (Auth.)

17653. Gilderhus, Philip A., Bernard L. Berger, Joe B. Sills, and Paul D. Harman. 1973. THE EFFICACY OF QUINALDINE SULFATE: MS-222 MIXTURES FOR THE ANESTHETIZATION OF FRESHWATER FISH. U.S. Dept. of the Interior, Bur. of Sport Fish. & Wildl., Investigations in Fish Control No. 54, pp. 1-9.

Combinations of quinaldine sulfate ($QdSO_4$) and MS-222 were tested for their efficacy in anesthetizing 14 species of freshwater fish. The combinations induced rapid and deep anesthesia as does MS-222 and permitted long safe holding times as does $QdSO_4$. The concentrations of the combined anesthetics needed were considerably lower than those needed when MS-222 is used alone. Most salmonids tested required concentrations of 10:20 to 10:40 mg/l ($QdSO_4$:MS-222) for effective anesthetization. Warmwater species generally required higher concentrations of 10:40 to 20:75 mg/l. Large adult fish usually required higher concentrations than smaller fish. Both compounds lower the pH of the solution, and at pH's approaching 6.0 or below the combinations were much less effective. In soft waters where the pH was lowered to that point, buffering the pH back to 6.5 or higher restored the activity of the anesthetics. (Authors)

17654. Moore, J. W., and I. A. Moore (School of Biol. Sci., Univ. of Bath, Bath, Somerset, England). 1974. FOOD AND GROWTH OF ARCTIC CHAR, Salvelinus alpinus (L.), IN THE CUMBERLAND SOUND AREA OF BAFFIN ISLAND. J. Fish Biol., 6(1): 79-92.

Arctic char, Salvelinus alpinus (L.), captured during the summer, 1972, in Cumberland Sound, Baffin Island, fed mainly on planktonic amphipods (Parathemisto libellula, Pseudalibrotus glacialis), copepods (Calanus hyperboreus), and fish (Boreogadus saida, Myoxocephalus sp.), but failed to utilize coelenterates, planktonic gastropods, and epi- and infauna. The considerable variation in the species composition of the diet of char of different lengths was due primarily to size selection. The average length of all individuals in stomach contents and or representatives of most food species increased with the length of fish. The minimum and maximum length of frequently ingested organisms increased four and ninety times, respectively, as char increased from 4 to 85 cm. Char less than 10 cm in length captured in rivers tributary to the Sound fed mainly on larval Chironomidae (Eukiefferiella bavaria) during the summer, whereas those longer than 10 cm fed predominantly on other char. During the winter the stomachs of the smaller individuals were always empty while the diet of the large char was restricted to other fish. Most species available to the char were consumed in proportion to their relative abundance in the rivers. The dry weight of stomach contents, when expressed on a unit weight basis, decreased with the wet weight of char in both fresh and salt water. Thus, fish 10 g in weight contained approximately 1.5 times more food in their stomachs than those weighing 1000 g. The stomach contents of char captured in salt water weighed approximately 11 times more than those of char of comparable size captured simultaneously in fresh water. The fish fed at random intervals during the day and ceased feeding at night. Arctic char, at all sampling areas, had reached a length of approximately 9.6 cm after four years. Upon migrating to salt water, their growth rate increased sharply with the result that after eight years they were 26.5 cm in length, reflecting food availability. The growth rate gradually decreased in fish older than nine years so that 20 year olds were approximately 70.0 cm in length. (Authors)

17655. Pierce, Robert J., Ronald L. Wiley, and Thomas E. Wissing (Dept. of Zool., Miami Univ., Oxford, Ohio 45056). 1973. INTERCONVERSION OF UNITS IN STUDIES OF THE RESPIRATION OF AQUATIC ORGANISMS. Progr. Fish-Cult., 35(4): 207-208.

Procedures for the conversion of partial pressures (mm Hg) of oxygen in water to volumetric values (ml/l or mg/l) are presented in a step-wise manner. Conversion factors are presented for values at 5°C intervals over the range of 0° to 50°C. Finally, a sample problem is given to show the actual application of the conversion factors. (Authors)

17656. Wedemeyer, Gary, and W. T. Yasutake (Bur. of Sport Fish. and Wildl., Western Fish Dis. Lab., Sand Point N.S.A., Seattle, Washington 98115). 1974. STRESS OF FORMALIN TREATMENT IN JUVENILE SPRING CHINOOK SALMON (Oncorhynchus tshawytscha) AND STEELHEAD TROUT (Salmo gairdneri). J. Fish. Res. Board Can., 31(2): 179-184.

The physiological stress of 200 ppm formalin treatments at 10 C is more severe in the juvenile steelhead trout (Salmo gairdneri) than in the spring chinook salmon (Oncorhynchus tshawytscha). In the steelhead, a marked hypochloremia follows a 1-hr treatment and recovery requires about 24 hr. During longer treatments, hypercholesterolemia together with reduced regulatory precision, hypercortisolemia, alkaline reserve depletion, and hypocapnia unaccompanied by a fall in blood pH occur - suggestive of compensated respiratory alkalosis. In the spring chinook, hypochloremia and reduced plasma cholesterol regulatory precision are the significant treatment side effects but recovery requires only a few hours. Formalin treatments also cause epithelial separation, hypertrophy, and necrosis in the gills of both fishes but again, consistent with the physiological dysfunctions, these are more severe in the steelhead. (Authors)

17657. Lewis, Robert M., and Walter C. Mann (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. OCCURRENCE AND ABUNDANCE OF LARVAL ATLANTIC MENHADEN, Brevoortia tyrannus, AT TWO NORTH CAROLINA INLETS AND A LIST OF ASSOCIATED SPECIES. Proc. Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ., No. 1, pp. 142-147.

A comparison was made of the relative abundance of Atlantic menhaden larvae entering Beaufort and Bogue Inlets in Onslow Bay, North Carolina. Two years of study at Beaufort Inlet, 1966-67 and 1967-68, and a 1-year study at Bogue Inlet showed that larvae entered the inlet from November to April and were abundant in March. Examination of larvae showed condition factors (weight/length^3) changed with time and increased as larvae drifted back and forth with the ebbing and flooding currents and fed on plankton. The larger larvae left the lower estuary and moved upstream. A list is given of the other species collected with the menhaden. (Authors)

17658. Granberg, Kaj (Jyväskylän hydrobiologinen tutkimuslaitos, Salmela 40450 Jyväskylä 45, Finland). 1972. PHYTOPLANKTON AND PRIMARY PRODUCTION OF LAKE KONNEVESI, CENTRAL FINLAND, IN 1970. (Konneveden kasviplankton ja perustuotanto vuonna 1970). Suomen Kalatalous, 46(1): 11-19. In Finnish.

The material was collected once a month during May-September 1970, from two sampling stations situated in the north and south parts of Konnevesi. Primary production was studied by the constant light method (5,000 lux light, 20°C and incubation time 24 hr). In July one "in situ" measurement was made in the south of Konnevesi. The differences in the species succession may have been due to differences in the temperature conditions of the north and south of the lake. Chrysophyceae and Cryptophyceae dominated numerically in the phytoplankton; Cryptophyceae and the diatoms had the greatest biomasses. No significant differences existed between the mean biomasses of the northern and southern parts of Konnevesi. The mean primary production of the northern part of Konnevesi was 16.7 mg C_{ass}/m^3 per 24 hr; in the southern part it was 136 mg C_{ass}/m^3 per 24 hr. There were no significant differences between the mean primary production values of the two sampling stations. The primary production of the growing season was 88 kg C_{ass}/hectare in the northern part of Konnevesi and 67 kg C_{ass}/hectare in the southern part. These low values indicate that the lake is oligotrophic. About 90% of the primary production relates to the nannoplankton, which thus serves as the main food for the higher trophic levels in the nutrient chain. (Auth.)

17659. Voznyy, N. Ye., V. M. Ivasik, I. M. Karpenko, and Ye. D. Mel'nichuk (Ukrainian Inst. of Fisheries, L'vov Branch, L'vov, USSR). 1973. INTRODUCTION AND ADAPTATION OF AMUR CARP FOR HYBRIDIZATION WITH SMALL-SCALE CARP IN POND FISHERIES OF THE WESTERN UKRAINE. Hydrobiological Journal, 9(1): 55-57.

17660. McDaniel, James S., and Horace H. Bailey (Dept. of Biol., E. Carolina Univ., Greenville, North Carolina). 1974. SEASONAL POPULATION DYNAMICS OF SOME HELMINTH PARASITES OF CENTRARCHID FISHES. Southwestern Naturalist, 18(4): 403-416.

The occurrence and host-parasite relationships of eight common helminth parasites of four species of sunfish from three Oklahoma locations was studied. Two sites represented a mature man-made reservoir and partially flooded tributary stream; the third, an intermittent stream about to be covered with the rising water of a new impoundment. Parasite species and their incidence varied in different hosts in the same area, in the same host in different locations, in the same species of fish of different sexes and ages, and in fish during different seasons of the year. The greatest number of fish were infected during the fall and winter, and all helminth species were represented in fish by the time hosts were one year of age. Those parasites inhabiting the intestinal tract were of low extensity throughout the life span of the fish. Tissue-inhabiting parasites accumulated to high extensities in older fish, except for the plerocercoid of Proteocephalus ambloplitis and acanthocephalan cystocanths which rapidly disappeared as the host aged. A higher incidence of infection was found in female fish than in males for all species of parasites. (Authors)

17661. Selgeby, James H. (U.S. Bur. of Sport Fish. & Wildl., Ashland, Wisconsin 54806). 1974. IMMATURE INSECTS (PLECOPTERA, TRICHOPTERA, AND EPHEMEROPTERA) COLLECTED FROM DEEP WATER IN WESTERN LAKE SUPERIOR. J. Fish. Res. Board Can., 31(1): 109-111.

Five species of aquatic insects - two plecopterans, two trichopterans, and one ephemeropteran - usually found in streams or ponds were collected in water 32-100 m deep in western Lake Superior. All appear to be new records for the lake and all were collected from far greater depths than previously recorded for these forms. (Auth.)

17662. Migalovskaya, V. N. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Institut Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. CHRONIC EFFECT OF STRONTIUM-90 + YTTRIUM-90 ON THE FREQUENCY OF CHROMOSOMAL ABERRATIONS IN THE EMBRYONAL CELLS OF THE ATLANTIC SALMON. AEC Translation 7418 from Trudy Polyar Nauch. Issled., pp. 89-99; Selected Water Resources Abstracts, 7(4): p. 62, 1974.

Three radioactivity levels for Sr90 + Y90 were used: 2.10 to the minus 5th power curie/liter, 0.7.10 to the minus 6th power curie/liter and 0.6.10 to the minus 7th power curie/liter. Developing embryos of the Atlantic salmon were investigated in the stages of the blastometric and epithelial blastula, gastrula, and also at the age of one-day larvae. The criteria for the radiation effect were the mitotic index and the frequency of chromosomal aberrations. Temporary specimens stained with acetocaraine were investigated. No decrease in the percentage of dividing cells was detected in the investigated development stages. In variants with a radioactivity level of 2.10 to the minus 5th power curie/liter and in a combined exposure there was a reliable increase in the frequency of chromosomal aberrations, beginning with the epithelial blastula stage. A great diversity of types of chromosomal aberrations was noted: individual bridges, fragments, multiple bridges, presence in the cell of several fragments, multipolar mitoses, and formation of micronuclei.

17663. Hurst, R. E. (Dept. of Environ., Fish. and Mar. Serv., Vancouver Lab., Vancouver 8, British Columbia, Canada). 1974. A METHOD OF LIPID EXTRACTION SUITABLE FOR USE WITH AN ELECTRON CAPTURE DETECTOR. J. Fish. Res. Board Can., 31(1): 113-116.

A method of extracting oil is described in which ether is used as the lipophylic solvent in a monophase system. The method is as effective as the Bligh and Dyer method of extraction and avoids the use of chloroform, which interferes when gas chromatography is used with electron capture detection for analysis of the volatiles. (Auth.)

17664. Migalovskaya, V. N. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Inst. Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. EFFECT OF X-IRRADIATION ON THE GAMETES AND EMBRYONAL CELLS OF THE ATLANTIC SALMON. AEC Translation 7418 from Trudy Polyar Nauch. Issled., pp. 100-112; Selected Water Resources Abstracts, 7(4): p. 63, 1974.

A study was made of the influence of small radiation doses (50, 150, and 350 R) on the fertilizing capacity of spermia and on the frequency of chromosomal aberrations in the cells of Atlantic salmon embryos in the blastula and gastrula stages. These radiation doses did not cause an appreciable decrease in the fertilizing capacity of the spermia. The percentage of fertilization in the control and in all experimental variants was at the same level. The criterion for radiation damage to the nucleus was the frequency of the late anaphases with bridges and fragments. Statistically reliable differences were obtained for the frequency of chromosomal aberrations in all the studied stages of development between the control and the 350-R variant. Radiation damage to the nuclear apparatus persisted at approximately the same level during embryogenesis of the Atlantic salmon. No decrease in mitotic activity was noted during the studied development stages. With irradiation of the dividing egg in the blastula stage in a dose of 350 R there was a temporary lag in mitotic divisions and also an increase in the frequency of chromosomal aberrations. The chromosomal aberrations were represented for the most part by individual bridges and fragments. Multiple bridges and multipolar mitoses were encountered in individual cells.

17665. Konrad, John G., and Stanton J. Kleinert. 1974. SURVEYS OF TOXIC METALS IN WISCONSIN. REMOVAL OF METALS FROM WASTE WATERS BY MUNICIPAL SEWAGE TREATMENT PLANTS. Tech. Bull. No. 74, Dept. of Nat. Res., Madison, Wisconsin, pp. 2-7.

The Department of Natural Resources conducted a questionnaire survey of Wisconsin industries utilizing and/or consuming metals in 1971 and a field survey of municipal sewage treatment plants for metal content in 1972. Metals included in the survey were arsenic, cadmium, copper, chromium, lead, mercury, nickel, selenium and zinc. The southeastern corner of Wisconsin accounted for more than 65 percent (440,998 pounds) of the total metals use reported for the state. In general, high concentrations of metals in sewage treatment plants were associated with areas of high metal use and the average metal removal efficiency for all plants investigated was approximately 50 percent. (Authors)

17666. Carlson, F. T. (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. REARING MENHADEN LARVAE (PART 1). Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, p. 148.

In the late 1950's, we began laboratory studies to understand environmental effects on the survival and behavior of larvae and early juvenile menhaden. Collections of viable larvae were made by connecting a small live car, lined with plastic screening, similar to a crab float, to a conventional meter net. The apparatus, set in a flowing tidal current, had a forward partition to reduce water velocity in the area into which larvae funneled. After capture, larvae were sorted and transferred by dipping, rather than netting, to reduce handling mortality. Larvae held in black-walled containers had a mortality of less than 5%, considerably less than those held in clear glass containers. In feeding behavior studies, most field collected larvae had empty alimentary tracts. Unless MS-222 was used prior to preservation, larvae emptied out all or most of their gut contents. (Auth.)

17667. Lawler, Adrian R. (Section of Parasitol., Gulf Coast Res. Lab., Ocean Springs, Mississippi 39564). 1973. A NON-BAITED FISH TRAP FOR SHALLOW WATER. Progr. Fish-Cult., 35(4): 237-238.

A cylindrical, open-ended trap made of hardware cloth and that required no baiting is described. Procedures for setting and retrieving the traps are discussed. Over a 1-year period, 22 species of fishes and over 13 species of invertebrates were collected. (Auth.)

17668. Sills, Joe B., John L. Allen, Paul D. Harman, and Charles W. Luhning 1973. RESIDUES OF QUINALDINE AND MS-222 IN FISH FOLLOWING ANESTHESIA WITH MIXTURES OF QUINALDINE SULFATE: MS-222. U.S. Dept. of Interior, Bur. Sport Fish. & Wildl., Investigations in Fish Control No. 55, pp. 3-12.

Residues of quinaldine and MS-222 in 10 species of fish exposed to mixtures of quinaldine sulfate and MS-222 were determined using gas chromatography and spectrophotometry for quinaldine and colorimetry for MS-222. The residue concentrations of quinaldine and MS-222 decreased rapidly following withdrawal from the anesthetics. The mean concentration of 0-hour residues of quinaldine ranged from 0.15 to 6.92 μg/g depending on concentration, temperature, length of exposure, and species. The mean concentration of 0-hour residues of MS-222 ranged from 1.9 to 27.3 μg/g and decreased to near the background reading of the controls after 24 hours of withdrawal. The fish exposed to the same concentration of the mixture of anesthetics for 15 minutes generally contained higher concentrations of residues than those exposed for 5.5 minutes. Two weight groups of brook trout were exposed to the same concentrations of the mixed anesthetics for the same length of time. The smaller fish contained 1.22 times higher concentration of quinaldine residue and 1.43 times higher concentration of MS-222 residue than the larger fish. (Authors)

17669. Zweiacker, Paul L., Robert C. Summerfelt and Jeffrey N. Johnson (Okla. Coop. Fish. Unit, Okla. State Univ., Stillwater, Oklahoma 74074). 1973. LARGEMOUTH BASS GROWTH IN RELATIONSHIP TO ANNUAL VARIATIONS IN MEAN POOL ELEVATIONS IN LAKE CARL BLACKWELL, OKLAHOMA. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 530-540.

The growth history of largemouth bass in Lake Carl Blackwell is described. Variation in annual increments in growth of largemouth bass age groups I-III are examined in relationships to mean annual water level 1962 through 1967, when the annual average lake level was declining. Weighted mean average total lengths (mm) to the end of each year of life, i.e., to annulus formation which occurred in May, were: 140 (I); 279 (II); 369 (III); 425 (IV); 462 (V); 485 (VI); 504 (VII); and 531 (VIII). Growth in the first year was positively correlated ($r = 0.85$, $P < .035$) to the average annual lake level. In the second year the relationship was negative ($r = -0.95$, $P < .004$), that is, annual increments in growth in the second year of life were inversely related to the lake level. Growth increments in the third and fourth years also were negatively correlated with lake level but the correlation was non-significant ($P > .05$). It is hypothesized that first year growth declined with declining lake level because of a negative effect of the drawdown on littoral zone invertebrates upon which bass feed in the first year. Second year growth increased with declining lake levels because of greater vulnerability of forage fish to predation by the larger piscivorous bass. Comparisons were made of the growth history of largemouth bass in Lake Carl Blackwell with the Oklahoma average and median growth from other U.S. locations cited in the literature. Largemouth bass growth rates in Lake Carl Blackwell were about equal to growth rates in Missouri, Tennessee, Louisiana, California and other Oklahoma waters, but much better than growth rates in the northern tier states, Great Lakes, and northeastern states. (Authors)

17670. Alexander, D. Ross, and Hugh R. MacCrimmon (Dept. of Zool., Univ. of Guelph, Guelph, Ontario, Canada). 1974. PRODUCTION AND MOVEMENT OF JUVENILE RAINBOW TROUT (Salmo gairdneri) IN A HEADWATER OF BOTHWELL'S CREEK, GEORGIAN BAY, CANADA. J. Fish. Res. Board Can., 31(1): 117-121.

Within the 21,500 m^2 headwater, the standing population of juvenile rainbow trout reached a high of 7.05 g/m^2 in October. Production was maximum during August at 1.77 g/m^2. Total annual production is calculated at 284.5 kg (13.2 g/m^2). Spring emigrants (no less than 4830 fish weighing 69 kg) were age I (91%) and age II. Minimum calculated ratio of production to yield as emigrants was 4.1:1. Comparatively few age 0 fish emigrated during summer. Because of their demonstrated capability to produce juveniles, sensitive headwaters must be preserved from ecological disturbance to assure self-perpetuating rainbow trout populations in the Great Lakes. (Authors)

17671. Royce, W. F. (NMFS, NOAA, Washington, D. C. 20235). 1973. SALMON MANAGEMENT IN THE UNITED STATES. J. Fish. Res. Board Can., 30(12): 2386-2392.

The salmon fishery of the United States illustrates the major principles and problems of fishery management: regulation of the fishery, maintenance of the environment, and artificial augmentation of the stocks. It also includes controls both in fresh water and on the high seas. The industry has experienced the age-old conflicts between large- and small-scale fisheries, and administrators have had to wrestle with the problem of allocating the catch among various contenders. This problem has been confused with that of conservation. Prohibition of salmon traps, restrictions on size and mode of operation of purse seines, and prohibition of monofilament gillnets are examples of the kinds of compromises made between allocation and conservation. Dams, pollution, and other modifications of the freshwater environment have endangered salmon stocks. An early response was to raise salmon artificially and release them. For many years this technique was unsuccessful, and when it was evaluated most hatcheries were closed. In recent years the preservation of the genetic identity of the stock and improved diets and schedules of release have resulted in greater success of hatcheries. Spawning channels show promise of additional success. Another practice of value has been development of devices to pass fish over dams, both upstream and down. Control of fishing to provide adequate spawning has concentrated on manipulation of individual population units, an enormously complicated task since the number of these in United States streams is in the order of 10,000. Of these about 100 major ones are under separate control. Regulations depend on forecasts, since fishing takes place before the salmon reach spawning grounds. Forecasts have improved greatly in recent years, although much remains to be done. Among problems on which no great progress has been made are: extent and consequences of genetic change produced by selective fishing; causes of cycles, and alterations in these; effects of changing environment, especially subtle ones of temperature, dissolved oxygen, and pollution; control of recruitment, including release of hardy young. Difficult economic problems include the tendency for regulations to favor inefficient operators; high costs of research and regulation, borne not by users but by public funds. Administrative achievemen include: a high degree of environmental protection; remarkably parallel regulations in the three States principally involved, Alaska, Washington, and Oregon; successful joint regulation of international fisheries in cooperation with Canada and Japan. Problems which will continue to exist and increase in difficulty include protection of the environment of the salmon, rivalries between many diverse interest groups, and improvement in culture operations. The major step of restricting entry into the commercial salmon fishery is being contemplated in several locations. (Auth.)

17672. Wilson, F. Ray, George Somero, and C. L. Prosser (Dept. of Physiol., Univ. of Illinois, Urbana, Illinois). 1974. TEMPERATURE-METABOLISM RELATIONS OF TWO SPECIES OF Sebastes FROM DIFFERENT THERMAL ENVIRONMENTS. Comp. Biochem. Physiol., 47(2B): 485-491.

Oxidative and glycolytic enzymes were compared for Sebastes auriculatus, a shallow water species subject to the annual temperature cycle (22°C summer, 12°C winter), and S. miniatus, which occurs below the thermocline (10°C). Cytochrome oxidase activity of muscle from S. miniatus was 70% higher than from S. auriculatus at 10, 15 and 20°C. In cross temperature acclimation, S. auriculatus showed a marked compensation in cold water, S. miniatus a small amount of acclimation in warm water. Lactate dehydrogenase and pyruvate kinase activities were similar in the two species both when taken from natural summer temperatures and after cross-acclimation. (Authors)

17673. Smith, H. G., R. K. Burnard, E. E. Good, and J. M. Keener (U.S. Soil Conservation Service, Columbus, Ohio). 1973. RARE AND ENDANGERED VERTEBRATES OF OHIO. Ohio Journal of Science, 73(5): 257-271.

This paper, an annotated list of Ohio's rare and endangered vertebrate species, was compiled to supplement a similar national list and includes 10 mammals, 62 birds, 10 reptiles, 4 amphibians, and 33 fishes. (From Authors)

17674. Tyler, Robert E., and Raj V. Kilambi (Dept. of Zool., Univ. of Arkansas, Fayetteville, Arkansas 72701). 1973. TEMPERATURE-LIGHT EFFECTS ON GROWTH, FOOD CONSUMPTION, FOOD CONVERSION EFFICIENCY, AND BEHAVIOR OF BLUE CATFISH, Ictalurus furcatus (LeSueur). Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 553-565.

17675. Kleinert, Stanton J., Paul E. Degurse, and J. Ruhland 1974. SURVEYS OF TOXIC METALS IN WISCONSIN. CONCENTRATION OF METALS IN FISH. Tech. Bull. No. 74, Dept. of Nat. Res., Madison, Wisconsin, pp. 8-15.

Concentrations of metals found in fillets of fish sampled from Wisconsin waters were less than 0.05 ppm for cadmium, 0 to 0.42 ppm for chromium, 2.7 to 18.3 for zinc, 0 to 4.31 for lead and 0 to 0.35 for arsenic. Based upon the fish tested in this survey, we do not believe these metals are present in sufficient amounts to create any hazards to consumers. (Authors)

17676. Marcy, Barton C., Jr., and F. Paul Richards (Essex Marine Lab., Essex, Connecticut 06426). 1974. AGE AND GROWTH OF THE WHITE PERCH Morone americana IN THE LOWER CONNECTICUT RIVER. Trans. Amer. Fish. Soc., 103(1): 117-120.

White perch age and growth data were obtained from 1,706 fish collected in a 63-km section of the lower Connecticut River between 1966 and 1969. Peak annulus formation occurred from late April to mid-May and fish formed their scales around 20 mm standard length. Most growth (53%) occurred in the first 2 yr of life. Growth rate was faster than in 15 other populations. Growth in the upper Connecticut River was similar to that of the species in the lower river for the first 2 yr of life, but thereafter none of the populations grew as fast as white perch in the lower Connecticut River. Longevity was lowest in the Connecticut River and other waters of Connecticut, maximum observed age being seven. Older fish have been found in all other white perch populations. The length-weight relationship was Log W(g) = -1.425 + 2.891 Log L (r = .96). There was a reduction in the average calculated length in all age classes in each succeeding year. This trend is directly opposite that of Lee's phenomenon and suggests possible stunting. (Authors)

17677. Williams, George C., Doris C. Williams, and Robert J. Miller (Marine Sci. Res. Center, State Univ. of New York, Stony Brook, N. Y. 11790). 1973. MORTALITY RATES OF PLANKTONIC EGGS OF THE CUNNER, Tautogolabrus adspersus (Walbaum), IN LONG ISLAND SOUND. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 181-195.

This study is based mainly on plnaktonic eggs of cunner, Tautogolabrus adspersus (Walbaum), collected from a variety of habitats along the south shore of Long Island Sound. Embryonic development has been divided into six growth stages, ranging from fertilization to hatching, with each stage representing about one-sixth of the development. A method for determining mortality rates, called "embryonic survival ratio" (ESR) was developed, based on use of the six-stage system. By the use of this system, it was determined that about one cunner egg in 20 survived to hatching in the study area. (Authors)

17678. Rhodes, W., and J. V. Merriner (Virginia Inst. of Mar. Sci., Gloucester Point, Virginia 23062). 1973. A PRELIMINARY REPORT ON CLOSED SYSTEM REARING OF STRIPED BASS SAC FRY TO FINGERLING SIZE. Progr. Fish-Cult., 35(4): 199-201.

One million striped bass (Morone saxatilis) sac fry were introduced into a 10-ft diameter plastic-lined pool having a capacity of 900 gal. Fish were fed brine shrimp nauplii and a prepared flake food. Heavy mortalities reduced the number of fish to 24,000 by day 32. Subsequent mortality was slight through age 53 days; there were 18,000 survivors. At age 56 days cannibalism became a major mortality factor in the pool, reducing the population to approximately 4,000 fish by day 67. Closed system culture appears to have potential for large-scale rearing since the cost per fingerling is low, production of fish per unit area is high and control of water quality and disease is excellent. (Authors)

17679. Joseph, J. (Inter-American Tropical Tuna Comm., c/o Scripps Inst. of Oceanogr., La Jolla, California 92037). 1973. SCIENTIFIC MANAGEMENT OF THE WORLD STOCKS OF TUNAS, BILLFISHES, AND RELATED SPECIES. J. Fish. Res. Board Can., 30(12): 2471-2482.

This paper reviews past experience in tuna research and management, and proposes guidelines for the future. The resources discussed include three major groups: the six principal market species of tunas, which are heavily exploited; the billfishes, which are in most cases heavily exploited; and the secondary market species of smaller tuna and tuna-like fishes, which are generally underexploited. A brief review of their nomenclature, biology, and fisheries is given, followed by comments on the condition of the stocks. A discussion of institutional arrangements for the scientific study and management of tuna resources is presented, and such arrangements are examined in the light of problems which might be unique to tuna and tuna-like fishes. These special problems and ways in which they might be handled are considered. (Auth.)

17680. Ball, Robert L., and Raj V. Kilambi (Dept. of Zool., Univ. of Arkansas, Fayetteville, Arkansas 72701). 1973. THE FEEDING ECOLOGY OF THE BLACK AND WHITE CRAPPIES IN BEAVER RESERVOIR, ARKANSAS, AND ITS EFFECT ON THE RELATIVE ABUNDANCE OF THE CRAPPIE SPECIES. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 577-590.

Stomachs of black and white crappies (Pomoxis nigromaculatus and P. annularis) collected during the early impoundment (1964-1967) and the late impoundment (1969-70) periods from Beaver Reservoir were analyzed. Black crappie were dominant in the early impoundment period, whereas white crappie was the dominant crappie species in the late impoundment period. During the early impoundment period, large numbers of earthworms (January to April) and shad (during the remainder of the year) were consumed by both species, although white crappie appeared to concentrate on shad even when earthworms were available. During the late impoundment period 0-age fishes, zooplankton, and aquatic insects comprised the diet of both species. However, white crappie adults concentrated on fishes all year round, whereas black crappie adults concentrated on benthic insects in the spring and fishes in other seasons. The availability of earthworms and benthic insects in the early impoundment period and their lack of availability in the late impoundment period, along with the deterioration of much of the submerged terrestrial vegetation, appear to have been the major factors in determining the dominance of the two crappies. (Authors)

17681. McKnight, Terrence C., and Steven L. Serns (Wisconsin Dept. of Nat. Res., Rhinelander, Wisconsin 54501). 1974. FOOD HABITS OF COHO SALMON (Oncorhynchus kisutch) IN AN INLAND WISCONSIN LAKE. Trans. Amer. Fish. Soc., 103(1): 126-130.

The most frequent food items in 185 coho salmon (Oncorhynchus kisutch) stomachs were insects, but fish comprised the most food by volume. The coho ranged from 190 to 444 mm total length and were collected during all seasons of the year. As the coho grew, fish comprised a greater part of their diet. No well defined pattern of insect feeding in relation to coho size was apparent. The percent frequency of fish ingested was highest during the winter (69%) and was 40% or less during other seasons. The percent volume of fish in the diet was over 58% in each season, and the highest percent volume of fish was consumed during the winter (93%). (Authors)

17682. McCarthy, D. H., J. P. Stevenson, and M. S. Roberts (Fish Dis. Labs., Min. of Agric., Fish. and Food, Weymouth, Dorset, England). 1974. VIBRIOSIS IN RAINBOW TROUT. J. Wildl. Dis., 10(1): 2-7.

An epizootic of sub-acute vibriosis occurred among a population of rainbow trout (Salmo gairdneri) during experimental acclimatization to sea water. The causative organism was identified as Vibrio anguillarum and its characteristics are listed. (Authors)

17683. Reinert, Robert E., and Harold L. Bergman (Bur. Sport Fish. & Wildl., Great Lakes Fish. Lab., Ann Arbor, Michigan 48107). 1974. RESIDUES OF DDT IN LAKE TROUT (Salvelinus namaycush) AND COHO SALMON (Oncorhynchus kisutch) FROM THE GREAT LAKES. J. Fish. Res. Board Can., 31(2): 191-199.

Concentrations of DDT residues were higher in lake trout (Salvelinus namaycush) from southern Lake Michigan in 1966-70 (average 18.1 ppm in fish 558-684 mm long) than in lake trout of the same size-class from Lake Superior in 1968-69 (4.4 ppm), and higher in adult coho salmon (Oncorhynchus kisutch) from Lake Michigan in 1968-71 (averages for different year-classes, 9.9-14.0 ppm) than in those from Lake Erie in 1969 (2.2 ppm). Residues were significantly higher in lake trout from southern Lake Michigan than in those from the northern part of the lake. In lakes Michigan and Superior, the levels increased with length of fish and percentage oil. In Lake Michigan coho salmon, the residues remained nearly stable (2-4 ppm) from September of the 1st yr of lake residence through May or early June of the 2nd yr, but increased three to four times in the next 3 mo. Residues in Lake Erie coho salmon did not increase during this period, which preceded the spawning season. Although the concentrations of total residues in whole, maturing Lake Michigan coho salmon remained unchanged from August 1968 until near the end of the spawning season in January 1969, the residues were redistributed in the tissues of the spawning-run fish; concentrations in the loin and brain were markedly higher in January than in August. This relocation of DDT residues accompanied a marked decrease in the percentrge of oil in the fish, from 13.2 in August to 2.8 in January. Concentrations of residues were relatively high in eggs of both lake trout (4.6 ppm) and coho salmon (7.4-10.2 ppm) from Lake Michigan. The percentage composition of the residues (p, p'DDE, o, p'DDT, p, p'DDD, and p, p'DDT) did not differ significantly with life stage, size, age, or locality, or date of collection of lake trout or coho salmon. (Authors)

17684. Chavin, Walter (Dept. of Biol., Wayne State Univ., Detroit, Michigan 48202). 1973. A RELIABLE WATER TEMPERATURE CONTROL APPARATUS FOR OPEN FRESHWATER SYSTEMS. Prog. Fish-Cult., 35(4): 202-204.

Adequate control of water temperature is essential for the culture of test and food fishes. An approach wherein water temperature is accurately controlled and maintained or automatically rejected if the water failed to meet the required temperature limits is described. The entire system is fabricated from commercially available components. Air pressure operates the necessary temperature controllers and the mixing valves. Water flow rate is not a limiting factor unless piping greater than 1-1/4 in. is required. (Auth.)

17685. Auld, Andrew H. (Dept. of Biol., Univ. of West Florida, Pensacola, Florida 32504). 1973. THE EFFECT OF CALCIUM ON THE OSMOTIC TOLERANCE OF JUVENILE STRIPED MULLET (Mugil cephalus L.). Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 591-597.

Juvenile striped mullet, ranging in size from 25 mm to 150 mm standard length and acclimated to 10% and 50% seawater, were subjected to direct transfer from acclimation salinity to salinity levels varying from distilled water to 200% seawater. Tests were also made using two commercially prepared, osmotically balanced, synthetic seawater mixes; one containing twice the normal calcium level and the other calcium-free. The presence of calcium significantly increased both survival time and survival rate. Acclimation tests also indicated a beneficial effect from increased calcium levels. (Auth.)

17686. Schwartz, Joseph J. (Iowa Coop. Fish. Unit, Iowa State Univ., Ames, Iowa 50010). 1974. PREVALENCE OF PATHOGENIC PSEUDOMONAD BACTERIA ISOLATED FROM FISH IN A WARMWATER LAKE. Trans. Amer. Fish. Soc., 103(1): 114-116.

An inoculum was taken from the kidneys of 777 fish of 10 species from Clear Lake, Iowa, in 1970 and 1971. Aeromonas liquefaciens and Pseudomonas sp. were present in the different fish species at rates of 0 to 50%. A trend of higher carrier rate in the warm months was evident for several species. (Auth.)

17687. Podymakhin, V. N. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Inst. Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. RADIOMETRIC AND DOSIMETRIC CHARACTERISTICS OF EXPERIMENTS FOR DETERMINING THE INFLUENCE OF RADIOACTIVITY OF A WATER MEDIUM ON THE DEVELOPMENT OF EGGS OF THE ATLANTIC SALMON. AEC Translation 7418 from Trudy Polyar. Nauch. Issled., pp. 113-133; Selected Water Resources Abstracts, 7(4): p. 63, 1974.

A detailed study was made of the methodological characteristics and specific results of measurements of the radioactivity of the eggs (and their individual components) of the Atlantic salmon. The material was obtained in an experiment with the incubation of eggs in aquaria with water contamination by Sr90 + Y90, Co144 + Pr144 and Cs137 at the Ura-Guba Fish Hatchery during the period from October 1966 through June 1967. On the basis of radiometric data, the absolute values of some characteristics of the natural dose fields and radiation loads on eggs in aquaria with radioactive contamination of the water were determined. These load values determine the degree of the radiobiological effect of the isotopes in the water on the fish eggs.

17688. White, John C., Jr., and Joseph W. Angelovic (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. INTERACTIONS OF CHRONIC GAMMA RADIATION, SALINITY, AND TEMPERATURE ON THE MORPHOLOGY OF POSTLARVAL PINFISH, Lagodon rhomboides. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 199-217.

We determined interactions of three environmental factors (chronic gamma radiation, salinity, and temperature) upon the morphometrical growth of postlarval pinfish, Lagodon rhomboides, with a 3^3 factorial design experiment. We used combinations of three radiation levels (0, 0.83, 1.28 rads per hour), three salinities (10, 20, 30 °/oo), and three temperatures (15.0°, 20.0°, 25.0°C) in the experiment and measured nine different body characteristics on each of 1,215 fish. Statistically significant effects of the environmental factors are described only for the terminal sample (45 days) of 405 fish. Radiation affected two of the measured characteristics, salinity affected five, and temperature affected all nine characteristics. Interactions between radiation and salinity caused changes in four of the characteristics, and interactions of radiation and temperature altered eight. Salinity and temperature did not interact to alter the growth of postlarval pinfish. The second order interaction between radiation, salinity, and temperature affected seven of the nine characteristics measured. In general, temperature exerted the major influence on the growth of these animals, with an increase in temperature usually causing an increase in growth. Ecological implications are discussed. (Authors)

17689. Potter, I. C., F. W. H. Beamish, and B. G. H. Johnson (School of Biol. Sci., Univ. of Bath, Claverton Down, Bath BA2 7AY, Somerset, United Kingdom). 1974. SEX RATIOS AND LENGTHS OF ADULT SEA LAMPREYS (Petromyzon marinus) FROM A LAKE ONTARIO TRIBUTARY. J. Fish. Res. Board Can., 31(1): 122-124.

The mean lengths of adult males and females of the sea lamprey (Petromyzon marinus) migrating into the Humber River from Lake Ontario in each of the years 1968-1972 varied little, and were similar to those found by other workers in recently established populations in the upper lakes. In contrast, the ratio of males to females, which lay within the narrow range of 1:1 to 1.26:1, was similar to those reported for long-established populations. (Authors)

17690. Westman, Kai (Bur. of Fish. Investigation, Pitkansillanranta 1, SF-00 530 Helsinki 53, Finland). 1973. THE POPULATION OF THE CRAYFISH Astacus astacus IN FINLAND AND THE INTRODUCTION OF THE AMERICAN CRAYFISH Pacifastacus leniusculus Dana. From: Freshwater Crayfish, Ed. S. Abrahamsson; Lund, pp. 41-55. In English.

7691. Wootten, R. (Dept. of Zool., Imperial Coll., London, England). 1973. THE METAZOAN PARASITE FAUNA OF FISH FROM HANNINGFIELD RESERVOIR, ESSEX IN RELATION TO FEATURES OF THE HABITAT AND HOST POPULATIONS. J. Zool., 171(3): 323-331.

A survey of the metazoan parasite-fauna of eight species of fish from Hanningfield Reservoir, Essex was carried out between January 1968 and March 1969. Fifty-six brown trout, 89 rainbow trout, 181 perch, 165 ruffe, 31 roach, 31 tenspined sticklebacks, 4 eels and 1 stone-loach were examined. In addition, 125 rainbow trout were examined from adjacent raceways. Thirty-one species of parasites were found, 5 Monogenea, 9 Cestoda, 8 Digenea, 1 Acanthocephala, 4 Nematoda, 1 Annelida, 1 Mollusca and 2 Crustacea. The possible origins of the parasite fauna are discussed. The relative abundance of different groups of parasites is considered in relation to the physical and biotic features of the habitat. Parasite species with planktonic crustacean intermediate hosts and/or avian final hosts are particularly abundant. The introduction of trout has resulted in an oligotrophic element being added to an otherwise eutrophic parasite fauna. Possible changes in the parasite-fauna which may have occurred since construction of the reservoir are described. The parasite-fauna of rainbow trout from the raceways was found to be a reduced version of that of fish from the reservoir. (Auth.)

7692. Cameron, James N. (Inst. of Arctic Biol., Univ. of Alaska, Fairbanks, Alaska 99701). 1974. EVIDENCE FOR THE LACK OF BY-PASS SHUNTING IN TELEOST GILLS. J. Fish. Res. Board Can., 31(2): 211-213.

Retention of 15 μ diameter tracer-labelled microspheres in the gills was studied in some Alaskan teleosts. Neither adrenaline nor acetylcholine significantly affected the percentage retention, as predicted by earlier reports on by-pass shunts affected by these drugs. Retention of 50 μ microspheres was nearly complete, even under conditions reported to favor shunting. Histological examination of microsphere-treated gills revealed no accumulation in the reported shunt pathways under any conditions. If the shunts do exist, their significance would seem to be slight. (Auth.)

7693. Smith, Frederick G. (Dept. of Anatomy & Histology, Coll. of Vet. Med., Univ. of Georgia, Athens, Georgia 30601). 1973. LYMPHOCYSTIS DISEASE IN Cynoscion nothus, Cynoscion regalis AND Stellifer lanceolatus FROM GEORGIA ESTUARIES. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 598-608.

Lymphocystis disease is a viral disease of freshwater and marine fish. It was found in three species of Sciaenids along the Georgia coast. It was found in six of the eight estuaries sampled and appeared in three forms: cutaneous, visceral and ocular. The cutaneous and visceral lesions were typical. An ocular site of infection, however, had not been previously described. The lymphocystis cells were found in the choroid coat of the eye near blood vessels and transport of the virus to the infection site via the blood was suspected. The disease appeared in the fall and winter months in Cynoscion regalis and Stellifer lanceolatus. No conclusions could be drawn from the data on the seasonal appearance of the disease in Cynoscion nothus. Water temperature changes appear to be associated with the appearance and disappearance of the disease but additional factors need to be studied before a causal relationship can be established. There was no significant difference in the proportion of infected S. lanceolatus from lower salinity and higher salinity sample areas. (Auth.)

7694. Reimer, Rollin D., Kirk Strawn, and Allen Dixon (Dept. of Wildl. & Fish. Sci., Texas A&M Univ., College Station, Texas 77843). 1974. NOTES ON THE RIVER SHRIMP, Macrobrachium ohione (Smith) 1874, IN THE GALVESTON BAY SYSTEM OF TEXAS. Trans. Amer. Fish. Soc., 103(1): 120-126.

The migration of Macrobrachium ohione during its spawning season was observed from 1969 to 1971 in the Galveston Bay area. Maximum activity was at night and during the new moon. Rainfall seemed to be associated with increased movement. Salinities near 15 ‰ appeared to act as a barrier to movement of this species into the Galveston Bay system. (Authors)

17695. Anderson, Douglas P., and John R. Nelson (Bur. of Sport Fish. & Wildl., Western Fish Dis. Lab., Sand Point N.S.A., Seattle, Washington 98115). 1974. COMPARISON OF PROTECTION IN RAINBOW TROUT (Salmo gairdneri) INOCULATED WITH AND FED HAGERMAN REDMOUTH BACTERINS. J. Fish. Res. Board Can., 31(2): 214-216.

Rainbow trout (Salmo gairdneri) fed 1.0 mg Hagerman redmouth bacterin per fish for 2 wk had no detectable specific, circulating, agglutinating antibody. In fish given a single subcutaneous inoculation of 1.0 mg of bacterin per fish, antibody was present from 3 wk later until 3 mo later, when the final sample was taken. Median lethal doses at various intervals after the bacterins were administered indicated that the inoculated fish could withstand a greater challenge by subcutaneous inoculation of the virulent bacteria than the orally immunized fish. The fish fed the vaccine lost their protection within 6 wk, whereas the inoculated fish had high levels of protection through 3 mo. The degree of protection was also confirmed by a "natural" exposure challenge. (Authors)

17696. Hoss, Donald E. (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. METABOLISM OF LARVAL ESTUARINE FISH. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 218-219.

We determined the metabolism of two species of postlarval estuarine fish -- pinfish, Lagodon rhomboides, and croaker, Micropogon undulatus -- by measurement of their routine oxygen consumption (oxygen consumed by specimens whose only movements are spontaneous) under laboratory conditions. We compared oxygen consumption rates of the postlarvae with consumption rates of juveniles and adults of the same species. A large range in fish sizes necessitated use of two methods to measure oxygen consumption: a differential respirometer for fish up to 500 mg and a flowing water respirometer for larger fish. We determined oxygen consumption of postlarval croaker at four salinities (10, 20, 30, and 40 °/oo) and three temperatures (15.0°, 20.0°, and 25.0°C) after the fish were acclimated to the conditions. Routine metabolism of the postlarval fish, measured as oxygen consumption per unit weight of fish, changed very little over the size range used. Slope values, k, of regression lines calculated from the weight of the postlarval fish versus the amount of oxygen consumed, a, were close to unity (1.12 for croaker and 0.95 for pinfish). In larger fish, oxygen consumption per unit weight decreased as the fish increased in size. Routine metabolic rate of the croaker showed no significant difference at the four different salinities. Routine oxygen consumption of the croaker was significantly greater, however, at the higher temperatures. The Q_{10} values for croaker were 1.77 for the temperature range of 15.0° to 20.0°C and 0.77 for the range 20.0° to 25.0°C. Results of pinfish were similar. (Auth.)

17697. Buchanan, Chester C., and Arlo W. Fast (NOAA, NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. EFFECT OF FISHING TECHNIQUES AND BAITS ON THE CATCH RATES OF FIVE FISHES FROM A CALIFORNIA RESERVOIR. Prog. Fish-Cult., 35(4): 209-213.

The effects of angler choice of baits and fishing techniques on the species catch rates of channel catfish (Ictalurus punctatus), brown bullhead (I. nebulosus), yellow bullhead (I. natalis), bluegill (Lepomis macrochirus), and largemouth bass (Micropterus salmoides) were evaluated. Four species had consistent preferences for certain baits and fishing techniques. Of these the catch rates changed for channel catfish, bluegill, and largemouth bass when their preferred combinations of bait and fishing techniques were not considered during statistical analysis. (Authors)

17698. Podymakhin, V. N. (Polyarnyĭ Nauchno-Issledovatelskiĭ i Proektnyĭ Inst. Morskogo Rybnogo Khozyaĭstva i Okeanografii, Murmansk, USSR). 1971. SOME DATA ON THE DEPENDENCE OF DOSE EFFECT FOR EGGS OF ATLANTIC SALMON. AEC Translation 7418 from Trudy Polyar Nauch Issled, pp. 31-35; Selected Water Resources Abstracts, 7(4): p. 62, 1974.

17699. Ayles, G. B. (Dept. of Zool., Univ. of Toronto, Toronto, Ontario, Canada). 1974. FECUNDITY AND EGG SIZE OF A BROOD STOCK OF Salvelinus fontinalis X S. namaycush HYBRIDS (SPLAKE). J. Fish. Res. Board Can., 31(2): 217-220.

Estimates of average egg diameter and average number of eggs per female from a brood stock of Salvelinus fontinalis X S. namaycush (splake) hybrids were 0.468 cm and 1169 eggs, respectively. Variation in egg size between females was attributable to variation in both size and age of the fish, whereas differences in fecundity were attributed only to differences in female size. At a given size a splake had more and larger eggs than have been reported for lake trout. The significance of the findings is discussed in relation to the reestablishment of a viable trout population in Lake Huron. (Auth.)

17700. Perry, W. Guthrie, and Dudley C. Carver (La. Wild Life and Fish. Comm., Grand Chenier, Louisiana). 1973. LENGTH AT MATURITY AND TOTAL LENGTH-COLLARBONE LENGTH CONVERSIONS FOR CHANNEL CATFISH, Ictalurus punctatus, AND BLUE CATFISH, Ictalurus furcatus, COLLECTED FROM THE MARSHES OF SOUTHWEST LOUISIANA. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 541-553.

This paper describes the results of a length and weight at maturity study of channel catfish, Ictalurus punctatus, and blue catfish, Ictalurus furcatus. Total length-collarbone length and collarbone length-total length conversion factors were determined and are presented for future biological references. Data were collected from the marshes of Southwest Louisiana. (Authors)

17701. Davies, William D. (Bur. Sport Fish. & Wildl., No. Carolina Coop. Fish. Unit., N. C. State Univ., Raleigh, No. Carolina 27607). 1973. RATES OF TEMPERATURE ACCLIMATION FOR HATCHERY REARED STRIPED BASS FRY AND FINGERLINGS. Prog. Fish-Cult., 35(4): 214-217.

Laboratory studies were conducted on striped bass fry and fingerlings to determine the rate at which these fish acclimate to temperature change. For both sizes acclimation was more rapid to higher temperature conditions than to lower. Fry could be reacclimated to 60° from 70°F in approximately 35 hr; fingerlings required about 8 days to reacclimate to 60° from eigher 74° or 91°F. Fry required approximately 14 hr to reacclimate to 72° from 60°F; fingerlings required about 12 hr to reacclimate from 61° to 80°F. (Auth.)

17702. Roberts, Wayne E. (Mus. of Zool., Univ. of Alberta, Edmonton, Alberta, Canada). 1974. FIRST RECORD OF THE MOONEYE (Hiodon tergisus) IN ALBERTA. J. Fish. Res. Bd. Canada, 31(2): 220-221.

Fourteen specimens of the mooneye (Hiodon tergisus) were collected from the North Saskatchewan and Red Deer rivers in central Alberta, and are first records of this species from these rivers, representing a considerable westward extension of its known range. There appears to be an established population in the Red Deer River, where 13 of 35 Hiodon specimens examined were H. tergisus, the remainder being goldeye (H. alosoides). Only one of fifty-five Hiodon specimens examined from the North Saskatchewan River was H. tergisus. (Auth.)

17703. Kania, Henry J., and James O'Hara (Savannah River Ecol. Lab., Aiken, South Carolina). 1974. BEHAVIORAL ALTERATIONS IN A SIMPLE PREDATOR-PREY SYSTEM DUE TO SUBLETHAL EXPOSURE TO MERCURY. Trans. Amer. Fish. Soc., 103(1): 134-136.

After a 24-hr exposure to sublethal mercury concentrations of 0.1, 0.05 and 0.01 ppm Hg^{++}, the ability of mosquitofish to avoid predation by bass was impaired. Fish exposed to 0.005 ppm Hg^{++} were not affected. The degree of effect showed positive correlation with mercury concentrations. (Authors)

17704. McKenney, Thomas W. (NMFS, Brunswick Lab., Brunswick, Georgia 31520). 1973. LARVAL FISH STUDIES AT THE BUREAU OF COMMERCIAL FISHERIES BIOLOGICAL LABORATORY, BRUNSWICK, GEORGIA. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 160-161.

17705. Engel, Sandy (Lab. of Limnol., Univ. of Wisconsin-Madison, Madison, Wisconsin 53706). 1974. EFFECTS OF FORMALIN AND FREEZING ON LENGTH, WEIGHT AND CONDITION FACTOR OF CISCO AND YELLOW PERCH. Trans. Amer. Fish. Soc., 103(1): 136-138.

Preservation of cisco (Coregonus artedii) and yellow perch (Perca flavescens) for 72 hr in 10% formalin or by freezing reduced median total length by 0.7-2.1% for both species and increased median condition factor by 6.3-9.4% for cisco and 4.8-8.8% for yellow perch. Formalin increased median weight by 1.8% for cisco and 5.0% for yellow perch; freezing and thawing reduced weight by 1.7-2.0% for each species. Changes in length, weight, and condition factor were not significant for unpreserved fish remeasured after 72 hr, suggesting that the above changes were not entirely due to errors in measurement. The study revealed that even small changes in length or weight due to preservation can produce large errors in condition factor. (Auth.)

17706. Lingenfelter, Dennis P., and Robert C. Summerfelt (Okla. Coop. Fish. Unit, Okla. State Univ., Stillwater, Oklahoma 74074). 1973. ANGLER HARVEST IN HEATED FISHING DOCKS ON AN OKLAHOMA RESERVOIR. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 611-621.

In 1969-70 there were 50 active commercial, heated fishing docks on Grand Lake, a 18,818 hectare reservoir in northeastern Oklahoma. During the winter-spring of 1969-70, fishermen interviews were made to determine fishermen catch statistics. Docks were sampled Friday through Monday during the period 28 January through 30 April 1970. A total of 1365 interviewed fishermen caught 3963 fish in 4462 hours of fishing (0.89 fish/man-hour). One carp (Cyprinus carpio) was captured, with the balance of 3962 fish in the sample represented by white crappie (Pomoxis annularis) of 239 mm mean total length and 194 g mean weight. Age composition of 234 fishermen caught fish was 94% age group III and IV, with age IV comprising 67.1% of the catch. The total population of fishermen using 41 of the 50 commercial docks was obtained from records kept by the dock operators. Using creel interviews at 50 docks, the winter-spring harvest of white crappie and man-days of fishing in the heated docks was estimated. Fishing pressure was determined by extrapolating total man-days from 41 to all 50 docks and harvest was obtained by multiplying sample catch rates by total man-hours. Extrapolated total man-days of fishing in heated docks in 93 days from 28 January through 30 April 1970 was 31,494 man-days. The average trip length for sample data was 4.9 hours/trip and the total man-hours was 153,562 hours. Applying 28 January through 28 February 1970 catch rate and fishing pressure, stratified by weekend-weekday, as an estimate of the same parameters for 1 November 1969 through 27 January 1970, the estimate of the winter-spring 1969-70 (1 November through 30 April) fishing pressure was 60,016 man-days (3.19 man-days/ha) or 293,656 man-hours (15.60 man-hours/ha). Estimated total harvest was 255,024 fish (13.534 fish/ha) or 48,962 kilograms (2.60 kg/ha). Compared with kg/ha values for crappie from nine southern reservoirs, the heated fishing dock harvest on Grand Lake was greater than three and would comprise at least 30% of four others. Furthermore, the Grand Lake heated dock harvest of crappie approximated 19% of the unweighted mean angler harvest of crappie (9.0 kg/ha) from 79 U. S. reservoirs. Rotenone samples in the summer of 1970 indicated a total standing crop of white crappie to be 24.43 kg/ha. The total harvest from heated dock fishing, those fish not usually harvested by fishermen, 18.3% of the biomass of catchable-sized crappie were harvested by winter anglers fishing indoors in heated docks. (Authors)

17707. Gehrs, Carl W. (Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, Tennessee 37830). 1973. LOW TEMPERATURE: A POTENTIAL AID IN ANALYZING THE REPRODUCTIVE CHARACTERISTICS OF CALANOID COPEPOD POPULATIONS. Prog. Fish-Cult., 35(4): 242-243.

A rapid decrease in water temperature has been found to stun members of the species Diaptomus clavipes Schacht in zooplankton samples. By withdrawing water from a chilled sample and adding an alcohol-glycerin mixture the animals can be killed and preserved with ovigerous females retaining their clutches. (Auth.)

17708. Toivonen, Jorma (Riista- ja kalatalouden tutkimuslaitos, kalantutkimusosasto, Pitkänsillanranta 1 A, 00530 Helsinki 53, Finland). 1972. THE FISH FAUNA OF LAKE KONNEVESI (Konneveden kalasto). Suomen Kalatalous, 46(1): 39-44. In Finnish.

Altogether 25 fish species have been found in Lake Konnevesi. In addition, rainbow trout and brook trout have been introduced, but no natural reproduction of these fish has been observed. During 1969 and 1970 extensive test fishing was carried out in the benthic and pelagic waters, with series of gill nets, to elucidate the abundance of the different species. The southern part of Konnevesi is mainly deep, and here the dominant fish species, in descending order of abundance, were: vendace, perch, burbot and whitefish. These constituted 87.8% of the weight of the catches. The northern part of Konnevesi is rather shallow and here the most abundant fish species were: perch, vendace, roach and whitefish. They constituted 93.1% of the weight of the catches.

17709. Fisheries Research Board of Canada (Dept. of the Environ., 116 Lisgar St., Ottawa, Canada K1A 0H3). 1973. FAO TECHNICAL CONFERENCE ON FISHERY MANAGEMENT AND DEVELOPMENT. J. Fish. Res. Board Can., 30(12), Part 2 of 2 Parts, pp. 1921-2537.

17710. Brocksen, Robert W., and Jan P. Bugge (Dept. of An. Physiol., Univ. of Calif., Davis, California). 1974. PRELIMINARY INVESTIGATIONS ON THE INFLUENCE OF TEMPERATURE ON FOOD ASSIMILATION BY RAINBOW TROUT Salmo gairdneri Richardson. J. Fish Biol., 6(1): 93-97.

Juvenile rainbow trout demonstrated recognizable differences in their ability to assimilate useable energy from food organisms at three different water temperatures. This paper describes the technique and computations used to document these differences and discusses possible reasons for such differences. (Authors)

17711. Reed, J. R., W. Wieland, and T. D. Kimbrough (Dept. of Biol., Va. Commonwealth Univ., Richmond, Virginia 23220). 1973. A STUDY ON THE BIOCHEMISTRY OF ALARM SUBSTANCES IN FISH. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 608-610.

Two cyprinid fishes, Clinostomus funduloides and Notropis cornutus were tested with naturally occurring substances including some well-known biogenic amines. Behavioral responses to histamine were similar to those observed in previous tests with natural alarm substance extracts. A response threshold was obtained at 0.01 ppm. Spectrophotofluorometric emission spectra also indicated that the natural alarm substance known to exist in many species of fish may be a ringed or double ringed compound. (Authors)

17712. Cairns, J., Jr., E. L. Morgan, and R. E. Sparks (Biol. Dept. and Center for Environ. Studies, Va. Polytech. Inst. and State Univ., Blacksburg, Va. 24061). 1974. THE RESPONSE OF BLUEGILLS (Lepomis macrochirus Rafinesque) IN A POLLUTION MONITORING SYSTEM TO A DIURNAL TEMPERATURE CHANGE. Trans. Amer. Fish. Soc., 103(1): 138-140.

The breathing and swimming activity rates of four bluegills in a laboratory version of a pollution monitoring apparatus increased when the diurnal temperature cycle changed from a control cycle of 24.8-26.0 C to a treatment cycle of 24.8-29.2 C. The latter cycle simulated the temperature regime reported for the Potomac River in June 1961, at a location free of extraneous thermal effluents. If a bluegill response is being used to detect industrial pollution, critical response values must be determined so that a diurnal temperature change does not cause a false warning signal. The results of this investigation suggest that this can be accomplished. (Authors)

17713. Dangel, James R. (Coll. of Fish., Univ. of Washington, Seattle, Wash.). 1973. AN ANNOTATED BIBLIOGRAPHY OF INTERSPECIFIC HYBRIDIZATION OF SALMONIDAE. FAO Fisheries Circular No. 133, 32 p. (Distribution restricted).

17714. Briggs, Philip T. (N. Y. State Dept. of Environ. Conservation, Setauket, Long Island, New York 11733). 1973. COMPARISON OF THE FISH FAUNA OVER SAND-FILLED AND NATURAL BOTTOMS OF GREAT SOUTH BAY, NEW YORK - A PROGRESS REPORT. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 220-246.

We captured a total of 297,795 fish (weighing 303,477 grams) of 29 species in 62 seine hauls made over natural bottoms in Great South Bay between mid-May and mid-October in 1967 (exclusive of the month of June). Atlantic silverside, fourspine stickleback, and mummichog were principal species encountered over this environment. A total of 320,665 fish (weighing 486,201 grams) of 24 species were captured with equal effort during the same time period over adjacent sand-filled bottoms. Atlantic silverside and striped killifish dominated the catches made over sand-filled bottoms. Several species found in large numbers in one environment were either absent entirely or taken in considerably lower quantities in the other. In addition, we observed different size distributions for the same species in each of the two bottom types. (Auth.)

17715. Lotrich, Victor A., and William H. Meredith (Dept. of Biol., Univ. of Delaware, Newark, Delaware 19711). 1974. A TECHNIQUE AND THE EFFECTIVENESS OF VARIOUS ACRYLIC COLORS FOR SUBCUTANEOUS MARKING OF FISH. Trans. Amer. Fish. Soc., 103(1): 140-142.

A suitable technique for marking large numbers of small fish is subcutaneous injection of acrylic polymer emulsions. Nine of 15 colors used in mark-recapture studies were discernible for 4 mo or longer. (Authors)

17716. Grinstead, Bobby G., and Ricardo Gomez (Okla. Fish. Res. Lab., Norman, Oklahoma). 1973. CATCH OF COMMERCIAL AND GAME FISH WITH FOUR-FOOT TRAP NETS OF VARIOUS MESH SIZES. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 621-627.

The catch of commercial and game fish with 4-foot trap nets having minimum mesh sizes of 0.5, 2, and 3-inch, square measure, were compared. A small trap net having 0.5-inch webbing in the crib has been used for many years to sample fish from Oklahoma reservoirs. Various investigators have indicated that this gear has potential as a commercial fishing device. However, large catches of game fish, especially white crappie, was a serious detriment to this potential. Two designs of large mesh trap nets were therefore developed to determine if by enlarging the mesh size of the standard design, the catch rate of game fish would decline while the catch rate of commercial fish would remain constant. An investigation was conducted on Keystone Reservoir during 1971 and 1972. The results indicated that the large mesh trap nets did not take significantly fewer game fish. The catch of commercial fish was also reduced, but to a lesser extent, as the mesh size increased. However, this reduction was not deemed significant when considering the advantages of a smaller game fish catch. (Authors)

17717. Thorne, Richard E., and James J. Dawson (Fish. Res. Inst., Coll. of Fish., Univ. of Wash., Seattle, Washington 98195). 1974. AN ACOUSTIC ESTIMATE OF THE ESCAPEMENT OF SOCKEYE SALMON (Oncorhynchus nerka) INTO LAKE WASHINGTON IN 1971. J. Fish. Res. Board Can., 31(2): 222-225.

The feasibility of estimating the escapement of sockeye salmon (Oncorhynchus nerka) into Lake Washington by hydroacoustics was explored during 1971. Surveys were made of large fish targets within the lake just before and after the spawning migration of sockeye salmon up the Cedar River. A decrease was observed after the spawning migration comparable to the estimated escapement as determined by weir counts and spawning ground surveys. (Authors)

17718. Kalber, Frederick A. (Aquatic Sciences, Inc., Boca Raton, Florida 33432). 1973. RESEARCH ON OSMOTIC AND IONIC REGULATIONS IN FISH EGGS AND LARVAE WITH COMMENTS ON POLLUTION. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 197-198.

17719. Berst, A. H., and N. R. Payne (Ontario Ministry of Nat. Res., Fish and Wildl. Research Branch, Maple, Ontario, Canada). 1974. STREAM MIGRATION OF YEARLING SPLAKE (Salvelinus fontinalis X S. namaycush) PLANTED IN GEORGIAN BAY. J. Fish. Res. Board Can., 31(2): 226-229.

Yearling splake (Salvelinus fontinalis X S. namaycush) (F_4, F_5) released into Georgian Bay in 1971 and 1972, when lake surface temperatures averaged 5.5 C lower than the hatchery temperature, tended to move into streams within 3.6 km of the planting site where temperatures approached the hatchery temperature and the temperature preferendum of the hybrid. This tendency was not apparent in splake planted at later dates when the lake and hatchery temperatures were similar. Varying stream flows had no discernible effect on the migration of splake into the study streams. (Authors)

17720. Casselman, John M., and Harold H. Harvey (Dept. of Zool., Univ. of Toronto, Toronto, Canada). 1973. FISH TRAPS OF CLEAR PLASTIC. Prog. Fish-Cult., 35(4): 218-220.

A series of clear plastic traps was designed and tested for capture of fishes. The design was based on that of Great Lakes trap nets, but those constructed were small enough in size to be portable. These traps proved very satisfactory in fish species-specific studies and in limnological surveys, including sampling from difficult habitats. In the final design tested, small fish were captured in excellent condition and held separate from larger fish. (Authors)

17721. Benoit, Duane A. (U.S. Environ. Protection Agency, Natl Water Qual. Lab., 6201 Congdon Blvd., Duluth, Minnesota 55804). 1974. ARTIFICIAL LABORATORY SPAWNING SUBSTRATE FOR BROOK TROUT (Salvelinus fontinalis Mitchill). Trans. Amer. Fish. Soc., 103(1): 144-145.

An artificial spawning substrate for brook trout (Salvelinus fontinalis Mitchill) was developed for use in laboratory bioassay studies involving reproduction. The substrate consisted of a glass spawning box containing a compartmented screen egg retainer on top of which was placed a coarse screen with attached gravel to simulate the stream bottom. Egg viability from wild and hatchery trout spawning on this substrate averaged 96%. This new substrate design reduces considerably the time required to determine daily spawning activity in laboratory brook trout experiments. (Auth.)

17722. Peters, D. S., M. A. Kjelson, and M. T. Boyd (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. THE EFFECT OF TEMPERATURE ON FOOD EVACUATION RATE IN THE PINFISH (Lagodon rhomboides), SPOT (Leiostomus xanthurus) AND SILVERSIDE (Menidia menidia). Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 637-643.

Alimentary tract evacuation was studied by the serial slaughter method after a single unrestricted feeding on commercial pelletized food. Digestion rate was measured at 6, 12, 18, 24 and 30 C. At the lower temperatures there was a "latent" period immediately following ingestion during which the content of the stomach or alimentary tract did not decline. After adjustment for the "latent" period and logarithmic conversion of the amount of food present, evacuation rates were described by double logarithmic regressions which showed time for complete evacuation as a function of temperature and amount of food. Evacuation rates were also measured at 25 C for natural food consumed by each species and were similar to the rates using artificial food. (Authors)

17723. Menzel, Bruce W. (Dept. of Zool. and Entomol., Iowa State Univ., Ames, Iowa 50010). 1974. A MOUTHLESS CARP FROM TEXAS. Trans. Amer. Fish. Soc., 103(1): 142-143.

The astomous condition of a carp Cyprinus carpio from Texas resulted from healing of a recent injury. The specimen is emaciated and probably survived primarily off its own tissue reserves. (Auth.)

17724. Wegener, William, and Dennis Holcomb. 1973. AN ECONOMIC EVALUATION OF THE 1970 FISHERY IN LAKE TOHOPEKALIGA, FLORIDA. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 628-634.

In 1970 the Florida Legislature provided for a table of values for fish killed by water pollution. These data were applied to standing crop estimates to determine the monetary value of the 1970 fishery in 22,700 acre Lake Tohopekaliga. The limnetic portion of the fishery was valued at $4,335,120 or $321.12 per acre. The littoral portion was valued at $12,266,636 or $1,333.33 per acre. Although the littoral zone has a considerably higher value and is vital for the renewal of the fishery resource, it is continually subjected to accelerated encroachment and piecemeal destruction by a variety of means. Monetary estimates such as these enable biologists to express biological facts in terms of more conventional market pricing techniques when considering water-use policies. The fish values were also applied to harvest estimates derived from a concurrent creel survey to obtain an annual net value returned to fishermen of $560,008 emphasizing the importance of managing the fishery and habitat as a renewable resource. On the average, fishermen harvested 17.3 fish per acre per year valued at $24.35. Based on standing crop estimates, this represents a low utilization of the fishery present and the potential exists for a much higher net return. These monetary estimates are considered to be conservative and represent only a portion of the fishery. They do not include tangible fisherman costs, or the value of other organisms and use dependent on the fishery or habitat. (Authors)

17725. Hettler, William F., Jr. (NMFS, Atlantic Estuarine Fish. Center, Beaufort, North Carolina 28516). 1973. REARING MENHADEN LARVAE (PART 2). Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 149-157.

We have attempted to rear larval yellowfin menhaden, Brevoortia smithi, from eggs stripped for a wild, ripe female. The menhaden were reared in 150-liter fiberglass tanks; seawater was maintained at 30 °/oo salinity and 20.0°C temperature. Twelve hours of light were provided and each tankful of larvae was fed 3 ml of concentrated sea urchin blastulae per day. Twenty larvae (9 mm) were alive at the end of 2 weeks and one larvae lived 32 days and attained a length of 14.9 mm. (Auth.)

17726. Burke, Michael V., and K. H. Mann (Dept. of Biol., Dalhousie Univ., Halifax, Nova Scotia, Canada). 1974. PRODUCTIVITY AND PRODUCTION: BIOMASS RATIOS OF BIVALVE AND GASTROPOD POPULATIONS IN AN EASTERN CANADIAN ESTUARY. J. Fish. Res. Board Can., 31(2): 167-177.

In a narrow, shallow estuary on the east coast of Canada, the dominant intertidal invertebrates were bivalve and gastropod molluscs. On a sand flat Mya arenaria produced 11.6 $g \cdot m^{-2} \cdot yr^{-1}$ flesh dry weight with a production:biomass ratio of 2.54, whereas Macoma balthica produced 1.93 $g \cdot m^{-2} \cdot yr^{-1}$ with a P:B ratio of 1.53. On a Spartina marsh, Littorina saxatilis produced 3.25 $g \cdot m^{-2} \cdot yr^{-1}$ with a P:B ratio of 4.11. Approximate P:B ratios were applied to biomass figures for four other species to give the following estimates of productivity: Mytilus edulis on Zostera beds 19.7 $g \cdot m^{-2} \cdot yr^{-1}$ flesh dry weight; M. edulis on Spartina beds 3.5 $g \cdot m^{-2} \cdot yr^{-1}$; Nassarius obsoletus 1.15 $g \cdot m^{-2} \cdot yr^{-1}$; Melampus lineatus 1.1 $g \cdot m^{-2} \cdot yr^{-1}$; Lacuna vincta 0.06 $g \cdot m^{-2} \cdot yr^{-1}$. A total production of the molluscs in the estuary is estimated at 4.7% of the production of Spartina and Zostera (all measured in kcal). It is postulated that molluscs are the chief primary consumers in the inlet. (Authors)

17727. International Assoc. of Biological Oceanography (In collaboration with FAO, ICES, ICNAF and SCOR). 1973. REPORT OF THE INTERNATIONAL SYMPOSIUM ON THE EARLY LIFE HISTORY OF FISH. FAO Fisheries Report No. 141, 58 p. (Distribution restricted).

17728. Green, O. L. (Bur. Sport Fish. & Wildl., Southeastern Fish Cultural Laboratory, Marion, Alabama 36756). 1973. COMPARISON OF PRODUCTION AND SURVIVAL OF CHANNEL CATFISH STOCKED ALONE AND IN COMBINATION WITH BLUE AND WHITE CATFISH. Prog. Fish-Cult., 35(4): 225-226.

Channel catfish (Ictalurus punctatus) intensively cultured with blue (I. furcatus) and white (I. catus) catfish in ponds demonstrated better weight gains and higher survival than the other two species. Channel catfish averaging 38/lb when stocked alone increased to an average of 1.1 lb and in mixed culture to 1.3 lb during the 199-day experiment. Equal sized blue and white catfish increased to 0.8 lb during the same period. Average survival of channel catfish was 95% compared to 82% for blue catfish, and 44% for white catfish. Channel catfish present at 90%, 80%, and 50% of the mixed species populations accounted for 96%, 90%, and 68% of total weight harvested. (Auth.)

17729. Clark, John R., Chairman (NMFS, Sandy Hook Lab., Highlands, New Jersey 07732). 1973. RANGE AND DISTRIBUTION OF SOME ESTUARINE FISHES. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 247-268.

Data are given on: bluefish; striped bass; winter flounder; summer flounder; tautog; cunner; scup; sheepshead; pinfish; butterfish; spot; Atlantic croaker; Atlantic mackerel; bonefish; ladyfish; tarpon; alewife; blueback herring; American shad; striped mullet; white mullet; and Atlantic menhaden.

17730. Hoagman, Walter J. (Virginia Inst. of Mar. Sci., Gloucester Point, Va. 23062). 1974. FEEDING BY ALEWIVES (Alosa pseudoharengus) ON LARVAL LAKE WHITEFISH (Coregonus clupeaformis) IN THE LABORATORY. J. Fish. Res. Board Can., 31(2): 229-230.

Adult alewives (Alosa pseudoharengus) from Lake Michigan readily ate larval lake whitefish (Coregonus clupeaformis) of 16.3 mm (standard deviation 1.4 mm) average length in the laboratory. They ignored the larvae when the latter had grown to 19.5 mm (SD = 1.6 mm) and 24.9 mm (SD = 3.2 mm) average length. (Auth.)

17731. Schubel, J. R., and A. H. Auld (Chesapeake Bay Inst., The Johns Hopkins Univ., Baltimore, Maryland 21218). 1973. THERMAL EFFECTS OF A MODEL POWER PLANT ON THE HATCHING SUCCESS OF AMERICAN SHAD, Alosa sapidissima, EGGS. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Comm., Oct. 22-25, 1972, pp. 644-648.

A model power plant, constructed to simulate the time-temperature exposure histories experienced by organisms entrained in the intake of an actual plant, was used to study the thermal effects of an operating power plant on the hatching success of American shad, Alosa sapidissima, eggs. Eggs from a single female were divided into 5 sub-samples; two controls, and three experimental batches. One control was stocked immediately in a constant temperature bath. The second control was passed through the unheated plant to assess the mechanical effects of passage through the model plant on hatching success. The experimental batches of eggs were passed through the operating plant set to produce a $\triangle$ T of about 6°C, and were cooled at different rates to the intake temperature of 18.5°C. Exposure times to a $\triangle$ T of at least 6°C ranged from 5 to approximately 15 minutes, and the cooling period from 1 hour to nearly 3 hours. The hatching success of each of the controls was 88%, and it ranged from 82% to 84% for the experimental batches, being highest for the sub-sample with the shortest exposure to elevated temperature. The differences in the hatching success of the controls, and the experimental batches were however, not statistically significant. (Authors)

17732. Meyer, Fred P. (Bur. Sport Fish. & Wildl., Fish Farming Exp. Sta., Stuttgart, Arkansas 72160). 1973. ANTHELMINTHIC TREATMENT OF CHANNEL CATFISH FOR TAPEWORM INFECTIONS. Prog. Fish-Cult., 35(4): 205-206.

17733. Schreck, Carl B. (Dept. of Fish. & Wildl. Sci., Va. Polytech. Inst. and State Univ., Blacksburg, Virginia 24061). 1973. STEROID ASSAYS AND THEIR USEFULNESS IN FISHERIES RESEARCH. Proc. 26th Ann. Conf. SE Assoc. of Game and Fish Commissioners, Oct. 22-25, 1972, pp. 649-652.

Techniques used to quantify circulating levels of steroid hormones in teleostean fishes may help solve problems in fisheries research. Competitive protein binding assay used to determine levels of androgens, corticoids, and radioimmunoassay for estrogens allow analysis of relatively large numbers of samples within a short period of time. Results obtained by these methods indicate that rainbow trout (Salmo gairdneri) have endocrine responses to various stressors. Repeated bleeding causes a marked lowering of plasma androgens in the male while corticoids are increased in both sexes. Gonadectomy reduces androgens in the male more rapidly than in the female; estrogen levels are not appreciably altered. Carbon dioxide anesthesia greatly elevates plasma corticoids while tricaine methanesulfonate has no apparent effect on corticoids or androgens. Such information may be of use to researchers wishing to establish background levels of these hormones in extirpation experiments or in administration studies influencing the endocrine system. Steroid assays may also be of value in determining effects of sampling techniques or other experimental conditions. (Auth.)

17734. Dechtiar, Alex O. (Fish & Wildl. Res. Branch, Ont. Ministry of Nat. Res., Maple, Ontario, Canada). 1974. Cleidodiscus baldwini n. sp. (MONOGENOIDEA: ANCYROCEPHALINAE) FROM THE GILLS OF THE TROUT-PERCH (Percopsis omiscomaycus) OF LAKE HURON. J. Fish. Res. Board Can., 31(2): 163-165.

A new species of monogenean, Cleidodiscus baldwini, from the trout-perch (Percopsis omiscomaycus) is described. This is the first report of a monogenean of the genus Cleidodiscus from North American populations of the trout-perch. (Auth.)

17735. Richards, William J., and Frederick H. Berry (NMFS, Miami Lab., Miami, Florida 33149). 1973. PRESERVING AND PREPARING LARVAL FISHES FOR STUDY. Proc. of Workshop on Egg, Larval and Juvenile Stages of Fish in Atlantic Coast Estuaries, NOAA Tech. Publ. No. 1, pp. 12-19.

Current methods for fixing, preserving, sorting, and treating larval fishes are described. Recommendations are made and emphasis is placed on the need for further research. (Authors)

17736. Tong, Steven Shap Chow, William D. Youngs, Walter H. Gutenmann, and Donald J. Lisk (Res. and Development Labs, Corning Glass Works, Corning, New York). 1974. TRACE METALS IN LAKE CAYUGA LAKE TROUT (Salvelinus namaycush) IN RELATION TO AGE. J. Fish. Res. Board Can., 31(2): 238-239.

Chromium concentration increased and molybdenum and tin concentrations decreased in Lake Cayuga lake trout (Salvelinus namaycush) from age 1 to 12 yr. The concentration of the rare element rhodium ranged from about 100 to 200 ppb. The concentrations of 33 other trace metals in the fish are reported. (Authors)

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